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ROADS And STREETS
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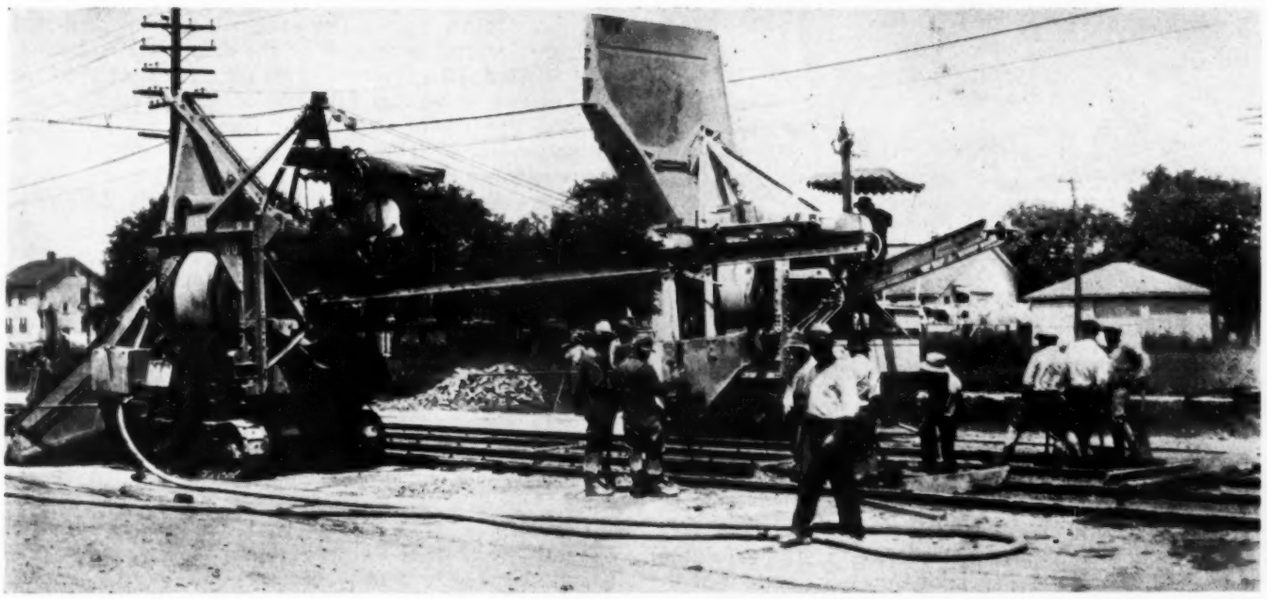


Job Set-Up Consists of Two Pavers, One Serving Each Track, with a Steam Shovel Boiler Trailing to Heat the Mixing Water

DETROIT CONTRIBUTES TO WINTER PAVING EXPERIENCE

LAST winter an extensive program of street car paving was carried out by the Detroit Street Railways, Detroit, Mich., which contributes valuable experience in the placing of pavement slab during freezing weather.

Features of particular interest were:

1. Placing of pavement slab at temperatures as low as —4° F.
2. Thawing, with sodium chloride, of 1 in. of subgrade which was frozen for up to 24 in.

Extent of Work—More than 24 single track miles of track reconstruction was completed, replacing unpaved cedar tie structures with standard monolithic steel tie structures. In addition, approximately 15 miles of block-paved track was rehabilitated. In this work, existing pavements were removed, rails were aligned, joints were cut in, thin rails removed from car stops, new rails were cut in, and the area repaved. Eighteen miles of right-of-way track were also cleaned up, including rejointing, surfacing and aligning.

In this work, the following materials were used:

2,925 tons of rail.
66,500 tons of concrete aggregates.
1,467.6 tons of fabricated steel ties.
60,110 bbl. of cement.
7,900 Thermit portions for welding rail joints and a large amount of other items such as wood block, iron shims, track bolts, etc.

In addition to those employed in producing and transporting these materials, an average of 5,000 men were given work on the project, in the early weeks, 30 hours per week, and in the later weeks, 24 hours per week.

Subgrade Preparation—Removal of old tracks and excavation for the new tracks was done by hand, using picks and shovels. Excavation included space for a 6 in. center tile drain, placed the full length of the construction with manholes and catch basins in the valleys of the streets. A drainage mat of broken slag, spread 4 ins. thick and compressed to 2 ins., was placed in the bottom of the trench.

As excavation and drainage were completed, rail and ties were laid and rail joints were Thermit welded.

Season and Temperatures When Slab Was Placed—Concreting of the tracks started Jan. 3 and continued to Feb. 15. Such work was new in Detroit, as both state and county ordinances had prohibited placing of concrete pavement slabs in freezing weather.

Temperatures during the period of concreting ranged from freezing to a low of 15 below. The average mean temperature was 26.3° F.

Care Was Taken to Get a Full Bedding of Concrete Under the Rail Structure

Job Set-up—A concreting unit was set up for each of the three jobs. A unit consists of two mixers traveling in pairs (on opposite sides of the track, with a steam shovel boiler trailing immediately behind, furnishing water at 100° F.).

Cold Weather Precautions—Materials were batched in two and three batch trucks, hot from the material yard, arriving on the job at a temperature between 40 and 50° F. Tarpaulins stretched tightly over the aggregate reduced heat loss during delivery.

The night before placing concrete, a strong solution of sodium chloride was sprinkled over the bottom of the trench to draw the frost out of the top inch of subgrade.

As soon as possible after placing the concrete base slab, a 1:2½:4 mix, without admix, it was covered with approximately 3 ins. of damp marsh hay, over which was spread 6 ins. of fine, close packing damp sand.

Frozen Subgrade Thaws As Concrete Cures—To determine the effect of this treatment on the concrete, and subgrade, a 14 in. inspection hole was made. Twenty-four hours after the concrete was placed (air at 16° F.) the small slab was removed from the inspection hole. Investigation showed the subgrade had thawed for 6 ins. or more while the air temperature had dropped to 4 degrees below zero. The subgrade thus contributed moisture for curing as well as the damp hay and sand.

Strength Tests—Over 40 cores were taken of the concrete at two, three and four weeks. The average compressive strength of all of these samples was 2,700 lbs. per square inch. The 28-day specimens averaged 3,056 lbs. per square inch. The standard specification for base concrete calls for a compressive strength of 2,500 lbs. per square inch in 28 days.

For experiment, all three crews placed short sections of slab on Feb. 8, when temperatures were at 4 degrees below zero. The usual procedure was followed, as on previous days. Six cores were taken of this concrete at 28 days. Tests showed it to have a compressive strength of 2,928 lbs. per square inch.

Inspection showed there was no frost in any of the entire group of cores taken from the project.

The job was carried out as a CWA project. It was an effective aid to local unemployment and today provides Detroit with a valuable public improvement.

Pavement Surfaces—Two types of surface are used by the Detroit Street Railways; sheet asphalt, and cement bound macadam.

LABORATORY REPORT—SUMMARY OF CORE TEST DATA

No.	Date	Pouring Location	Material	Age Days	Lb./sq. in.	Core No.	Remarks
8540	2-8-34	Van Dyke & Millbank	Gravel	28	2556	1	Placed in —0° weather
8540	2-8-34	Van Dyke & Millbank	Gravel	28	4207	2	Placed in —0° weather (—8°)
8541	2-7	100 ft. south of Van Dyke and Millbank	Gravel	28	3919	3	
8542	2-11	150 ft. north of Van Dyke and Millbank	Gravel	28	2729	4	
8543	2-12	500 ft. south of 8 miles on Van Dyke	Gravel	28	2853	5	
8536	2-8	Harper and Burns	Limestone	28	3617	1	Placed in —0° weather
8536	2-8	Harper and Burns	Limestone	28	3525	2	Placed in —0° weather (—8°)
8537	2-7	100 ft. east of Harper and Burns	Limestone	28	3248	3	
8538	2-11	100 ft. west of Harper and Burns	Limestone	28	3517	4	
8539	2-12	500 ft. east of Van Dyke and Harper	Limestone	28	2677	5	
8551	2-8	East Davison and MacKay	Gravel	28	1446	1	Placed in —0° weather
8551	2-8	East Davison and MacKay	Gravel	28	2219	2	Placed in —0° weather (—8°)
8499	2-5	East Davison and Jos. Campau	Gravel	14	2540	1	
8499	2-5	East Davison and Jos. Campau	Gravel	14	2617	7	
8499	2-5	East Davison and Jos. Campau	Gravel	14	2837	3	
8500	2-6	Hamilton south of 6 Mile Road	.....	14	2633	1	
8500	2-6	Hamilton south of 6 Mile Road	Gravel	14	2503	2	
8498	2-5	Harper west of Gratiot	Stone	14	2635	1	No. 2 core had 2 pcs. asphalt near top while No. 3 had air pocket at top. Poured at —0° (not frozen)
8498	2-5	Harper west of Gratiot	Stone	14	1470	2	
8498	2-5	Harper west of Gratiot	Stone	14	1216	3	
8497	2-3	Van Dyke north of 7 Mile Road	Gravel	14	1436	4	No. 4 had 3 in. diam pebble at outer edge. Poured at —0° (not frozen)
8497	2-3	Van Dyke north of 7 Mile Road	Gravel	14	1562	5	
8497	2-5	Van Dyke north of 7 Mile Road	Gravel	14	2313	6	
8466	1-10	East Davison	Gravel Reptd.	2-13	2923	1	
8466	1-12	East Davison	Gravel Reptd.	2-13	2955	2	
8466	1-12	East Davison	Gravel Reptd.	2-13	3448	3	
8467	1-25	West Davison	Gravel Reptd.	2-13	2138	No number	
8460	1-23	Van Dyke and 6 Mile Road	Gravel	2-7	2743	1	
8460	1-20	Van Dyke and 6 Mile Road	Gravel	2-7	3433	2	
8460	1-20	Van Dyke and 6 Mile Road	Gravel	2-7	2559	3	
8462	1-25	300 ft. west of Linwood on West Davison	Gravel	2-7	2168	1	
8462	1-25	300 ft. west of Linwood on West Davison	Gravel	2-7	2082	2	
8461	1-20	Jos. Campau	Gravel	2-7	2593	1	
8461	1-22	Jos. Campau	Gravel	2-7	2161	2	
8461	1-24	Jos. Campau	Gravel	2-7	3056	3	
8434	1-4	.....	No mat'l given	1-29	3379	1	
8434	1-5	Van Dyke	No mat'l given	1-29	3021	2	
8434	1-5	Van Dyke	No mat'l given	1-29	2539	3	
8433	1-3	Livernois	No mat'l given	1-29	2911	1	
8433	1-4	Livernois	No mat'l given	1-29	2305	2	
8433	1-4	Livernois	No mat'l given	1-29	3997	3	

Protective Straw and Sand Were Placed Over the Concrete Immediately to Retain All the Heat Possible

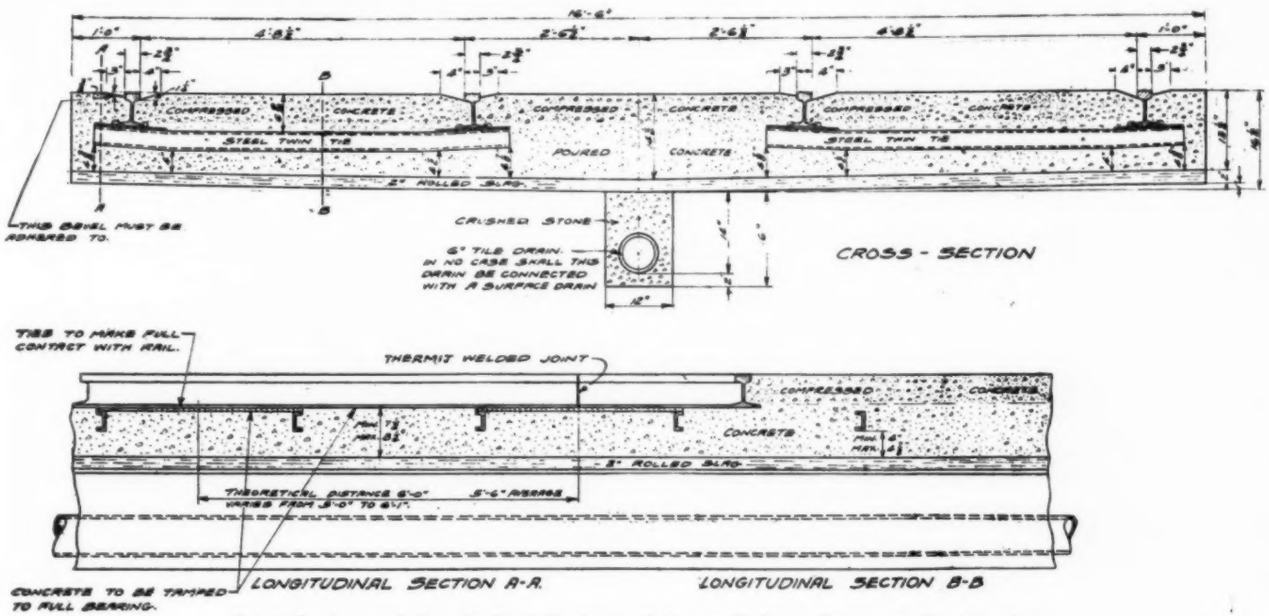
Standard practices are followed with sheet asphalt. Cement bound macadam has been used by the city since 1920. At first, red granite, trap rock and Waterville, O., limestone were used as the aggregate. Waterville limestone was finally adopted, it being the most economical.

A 2½ in. grading is used without grading down. A tolerance of 2 to 3 ins. is allowed. A 1:2 grout is used, placed before rolling. Grout is mixed in the pavers and discharged directly to the aggregates. The aggregate is rolled just before initial set with a 10-ton roller. A 5½ in. CBM slab is placed over concrete ballast. Recent costs show this thickness is being placed at $1.40 per square yard in place.

Typical Section of Slab After Danger of Freezing Was Past and Sand and Straw Blanket Had Been Removed

TEMPERATURE RECORD DURING PERIOD OF CONCRETING

Date	Mean	High	Low
Jan. 3	24	27	20
Jan. 4	28	33	25
Jan. 5	42	45	35
Jan. 6	39	36	34
Jan. 7	35	36	34
Jan. 8	34	36	32
Jan. 9	32	33	31
Jan. 10	30	31	28
Jan. 11	34	39	29
Jan. 12	34	37	30
Jan. 13	34	37	32
Jan. 14	32	34	31
Jan. 15	34	37	21
Jan. 16	26	30	23
Jan. 17	20	23	17
Jan. 18	26	39	16
Jan. 19	31	41	21
Jan. 20	27	33	20
Jan. 21	40	50	29
Jan. 22	45	50	40
Jan. 23	39	49	29
Jan. 24	37	47	27
Jan. 25	37	49	26
Jan. 26	30	35	24
Jan. 27	39	44	34
Jan. 28	26	45	8
Jan. 29	5	8	2
Jan. 30	7	13	1
Jan. 31	22	34	10
Feb. 1	25	30	20
Feb. 2	14	19	8
Feb. 3	16	24	9
Feb. 4	28	32	24
Feb. 5	23	26	20
Feb. 6	17	26	8
Feb. 7	16	22	9
Feb. 8	— 4	0	— 8
Feb. 9	— 8	0	—15
Feb. 10	16	30	— 3
Feb. 11	28	36	19
Feb. 12	30	37	23
Feb. 13	16	20	13
Feb. 14	26	43	9
Feb. 15	26	36	15
	26.3 Ave.		


CROSS - SECTION
LONGITUDINAL SECTION A-A
LONGITUDINAL SECTION B-B
THERMIT WELDED JOINT
CRUSHED STONE
6" TILE DRAIN.
IN NO CASE SHALL THIS DRAIN BE CONNECTED WITH A SURFACE DRAIN
CONCRETE TO BE TAMPED TO FULL BEARING.

Cross Section and Longitudinal Sections of Street Railway Pavement Construction

Low Cost Tar Surface in Pennsylvania

DEVELOPMENTS IN THE USE OF TAR FOR ROADS DURING 1934

By GEO. E. MARTIN

Consulting Engineer, General Tarvia Department, The Barrett Co., New York

NO STARTLING changes in the methods of using tars for highway purposes were introduced during the past year. On the whole the highway official has been content to follow the procedure used successfully for many years, making only such changes and modifications as were necessary to fit his local conditions. However, a close study of construction and maintenance operations reveals a number of relatively minor changes rather generally adopted to improve the quality of the work done.

The road tars themselves remain the same and no new grades or new types of tar products have been introduced in the past year. There has been a general tendency to use somewhat heavier grades of tars for all purposes.

Prime Coats and Tack Coats—Prime coats are used as first applications under surface treatments. Since they are expected to penetrate the road surface, the lightest grade of tar was formerly used for that purpose. Heavier cold application tars have been found to penetrate successfully all except the most dense surfaces, and to possess somewhat more binding strength. As a result tars with a specific viscosity up to 25 or 35 at 40° C. are now being used for this purpose, particularly in the South.

Tack coats are used primarily to bond a gravel or stone mix to the more or less solid material underneath. Tars with a specific viscosity at 50° C. as high as 22 are successfully used for this purpose. The heavier tar makes a sharper line of demarkation between the base and the top and prevents inclusion of the base material with the top during the mixing operations.

Surface Treatments—A large gallonage of tar has been used in surface treatments to preserve the surface of existing highways, to prevent skidding and to improve the riding qualities of road surfaces.

The tendency has been to use heavier tars although everything from the thinnest prime coat tar to penetration macadam binder is used.

Dragging, while it has improved the riding quality of the road surfaces, has introduced some new problems. Dragged surface treatments with large, one sized aggregate have not been successful. It is necessary to have the cover material fairly well graded so as to produce a tight, close surface. Dragged surface treatments of appreciable thickness will often be improved by the addi-

Mixing Tar and Gravel in Ontario, Canada

Resurfacing Streets in Messena, N. Y., with Tar Cold Mix

tion of a light liquid tar seal with a small sized cover. Such treatments are not slippery, even though they do show a tightly closed surface.

A brush drag is coming into general use instead of the sled drag where the contour of the road surface does not need to be materially altered. One county engineer replaced the blade of a grader with a series of brushes and used the equipment successfully on his surface treatment work.

Current labor regulations have often required the spreading of cover stone by hand. To even up and make uniform the cover stone after spreading, the brush drag has often been used. Several localities improve on this by using a strip of guard rail wire fencing. Dragged behind a motor truck, this spreads the covering material uniformly, although it will not remove large irregularities from the road surface.

Cut back tar, similar to that used for the preparation of cold patching material, has been used for surface treatment work in some localities.

Some work has been carried on in the surface treatment of stabilized bases. Preliminary studies and the experiences of many years in the surface treatment of sand clays and gravels indicate that a satisfactory wearing surface can be obtained by the use of tar.

Mixed-in-Place or Re-tread Surfaces—In the building of stone re-tread the construction practice has changed somewhat during the past year. Demand for more rapid setting material has led to the use of hot surface treatment tars as well as re-tread binders for this work. Bigger and better mixing machinery has made this possible. Several new mixing machines have been placed on the market and several graders have been designed especially for this work.

The following steps for the construction of stone re-tread are standard practice in many localities:

1. Spread stone to a loose depth of three inches.
2. Apply tar at the rate of ¾ gal. per square yard.
3. Mix and level off.
4. Roll.
5. Fill surface voids with small sized chips, sweep and roll.
6. Apply tar penetration coat at the rate of ¼ gal. per square yard.
7. Cover with small sized chips, sweep and roll.
8. Apply tar seal coat at the rate of ¼ gal. per square yard.
9. Cover with small sized chips, sweep and roll.

Gravel has been used extensively for mixed-in-place work during the past year. Here again heavier tars are being used ranging in some cases up to a specific viscosity at 50° C. of 36. Generally, however, the tar used will fall within the 16 to 26 range at 50° C. Seal coats are necessary on gravel mixes with these tars and have been quite generally used during the year. Generally a tar of the same viscosity as used for mixing has been used at rates ranging from one-tenth to four-tenths gallon per square yard depending upon the texture of the gravel mix surface. A tightly closed surface is necessary and desirable.

Plant Mixed Re-tread—While some plant mixing has been done using tar binder for re-tread surfaces this past year, the amount has not been great in comparison with mixed-in-place surfaces. One state used such a mix to cover a slipper surface on one of its trunk highways with successful results.

Tar-Sand Mixes—Several tar-sand mixes were built in the south adding only the tar to the sand already in place on the road. In general a mix about 6 ins. thick was built using up to 4 gals. of tar per square yard. However, one section 3 or 4 ins. thick with a hot tar seal and slag cover was noted. This is believed to be a step in the right direction. Heavy re-tread binder tars have been used in the tar-sand mixes.

Some work was done in other sections of the country using a 2 to 3 in. depth of tar-sand mix requiring about 1 gal. of tar per square yard for mixing and a seal coat of a quarter to one-half gallon per square yard in two applications. Sand cover has been used generally, although in some instances a stone chip or pea gravel has been used.

Tar-Sand Mastic for Block Pavements—Brick pavements have been quite generally constructed during the past year using a mixture of tar and sand for the cushion. Cold surface treatment tars of various grades have been used for this purpose. Five to seven per cent of tar has been used as the binder and the mixture was generally made in a concrete mixer.

Tar Penetration Macadam—Methods of building penetration macadam have changed but little in the past year except that more attention has been paid to obtaining a tightly closed top. For this purpose two seal coats as described under stone re-tread have been generally used. While the general use of penetration macadam has not increased, it is used extensively in some localities.

A modification introduced experimentally last year and used more extensively this year has been the substitution of a fine aggregate, tar bound, pre-mixed top for the penetration coat, seal coats, choke stone and cover stone. About 100 lbs. of the tar mix per square yard is required.

Plant Mixes—No radical changes have been made in the tar plant mixes designed to be used cold. The gradual change in most localities from car shipments to truck

Spreading Cold Bituminous Mix with Machine

Tar Re-Tread Near Rochester, N. Y.

shipments has made possible the use of somewhat heavier binders.

There has been a tendency to use smaller aggregate, more filler and more tar binder in the top course material. The natural result has been to use somewhat thinner top courses. This change produces a denser mix and a surface which is more tightly closed but still non-skid.

Machine finishing has gained greatly during the year. Highway officials are demanding surface tolerances which can be obtained most easily by machine finishing. Several satisfactory finishing machines for cold lay tar mixtures are now on the market and being extensively used.

Standardization—Some progress has been made in the standardization of names and consistencies for the various grades of road tars. The following grades are being suggested as a basis for standard specifications:

PRIME COAT TARS

TC-1	Specific viscosity at 40° C.	8-13
TC-2	Specific viscosity at 40° C.	13-18

COLD SURFACE TREATMENT TARS

TC-3	Specific viscosity at 40° C.	18-25
TC-4	Specific viscosity at 40° C.	25-35

RE-TREAD BINDERS

TM-1	Specific viscosity at 50° C.	16-22
TM-2	Specific viscosity at 50° C.	26-36

HOT SURFACE TREATMENT TARS

TH-1	Float test at 32° C.	60-150 seconds
TH-2	Float test at 32° C.	150-210 seconds

CONCRETE CRACK FILLER AND PENETRATION MACADAM BINDER

TP-1	Float test at 50° C.	100-160 seconds
TP-2	Float test at 50° C.	160-220 seconds

COLD PATCH BINDER

TCP-1	Specific viscosity at 40° C.	35-60
TCP-2	Specific viscosity at 40° C.	60-80

Spreading Tar for Surface Treatment of Gravel

The outstanding changes during the year have been the tendency to use heavier tars for almost all purposes, to use smaller and better graded cover on surface treatments and seal coats, to use seal coats more extensively as a part of the construction operations, and to use machines for mixing, spreading and finishing of all mixes. The result has been easier riding, safer and more nearly permanent road surfaces with road tars.

▼

Illinois Bituminous Distributor Contractors Organize Under Code Authority

In sessions at the Drake Hotel in Chicago, Dec. 3 and 4, 1934, held concurrently with meetings of the National Bituminous Association, Illinois operators of bituminous distributing apparatus listened to a discussion and explanation of the Code governing their industry, which became effective Nov. 26, 1934, and elected administrative officers for the ensuing year.

The Illinois association of distributor operators was first organized a year ago, when work on drawing up a Code for the industry began. At that time the association elected a staff of officers and directors who met with officers of the National association and with government officials at Washington, assisting in the work of drawing up the Code.

At this meeting the distributor operators adopted the name "Illinois Bituminous Distributors Association" and elected the following officers: President, Finis P. Ernest of East St. Louis; Vice-president, Geo. Kreiner of Rockford; Secretary-treasurer, G. J. Berkley of Chicago.

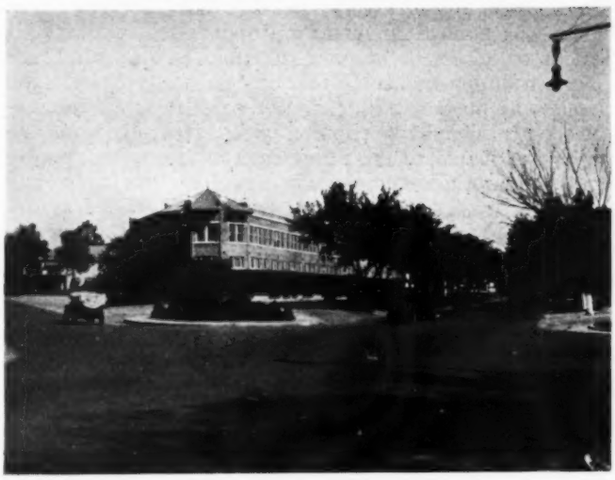
Directors chosen were: Earl Walker of Sullivan, Louis Marsch of Morrisonville, J. F. Powers of Bloomington, Thomas DeBrun of Assumption, R. H. Davidsmeyer of Jacksonville, S. A. Love of Chicago, Finis P. Ernest, Geo. Kreiner and G. J. Berkley.

To cooperate with the Code Authority, two code enforcement committees were appointed. For northern Illinois the committee consists of A. F. Schupp of Joliet, Geo. Kreiner of Rockford and B. J. Deming of Chicago. For central and southern Illinois, the committee consists of Earl Walker of Sullivan, J. F. Powers of Bloomington and R. H. Davidsmeyer of Jacksonville.

To draw up a more complete set of construction specifications for black top work than those now in use, a Committee consisting of Trumann Flatt of Springfield, B. J. Deming and L. L. Pelling of Chicago, was appointed. This committee will meet with engineers of bituminous material and aggregate producers, and with highway officials and engineers, to compile a broadened series of standardized specifications for resurfacing roads and streets.

With the adoption of their own separate Code, and election of administrative officers and committees, the Illinois distributor operators are now organized and prepared to carry on their business in full compliance with Code provisions. The Code does not provide for price-fixing, but requires (1) registration of members of the industry with the Code Authority; (2) open price filing with the office of the Code Authority; (3) provides against wilfully destructive price cutting; (4) enumerates fair trade practice regulations; (5) general labor provisions, with minimum wage scales and schedules of working hours, and (6) other detailed regulations for the industry.

Office of the Secretary of the association, G. J. Berkley, is at 5915 Rogers Ave., Chicago.



Concrete Paved Parking Areas for Neighborhood Shopping Centers

RECENT DEVELOPMENTS IN CONCRETE PAVEMENT DESIGN AND CONSTRUCTION

By W. S. BARKER

Regional Highway Engineer, Portland Cement Association

EACH year witnesses changes and improvement in concrete pavement practice. The year 1934 was no exception. Changes were largely centered around joints but there was also an increased use of designed mixes. Experiments with and use of vibration continued. New curing mediums were developed. The use of volume of traffic as well as weight in the design of pavement thickness was proposed. Hand broken brick and cobbles as coarse aggregate and a swing toward hand compaction instead of rolling, were the outstanding developments for cement bound macadam.

Vibration—The use of rapid vibration in striking off and consolidating pavements continued to be a feature of great interest to highway engineers and contractors. New Jersey continued vibration on all concrete pavement projects. Ohio has planned a second experimental vibration section for construction in 1935.

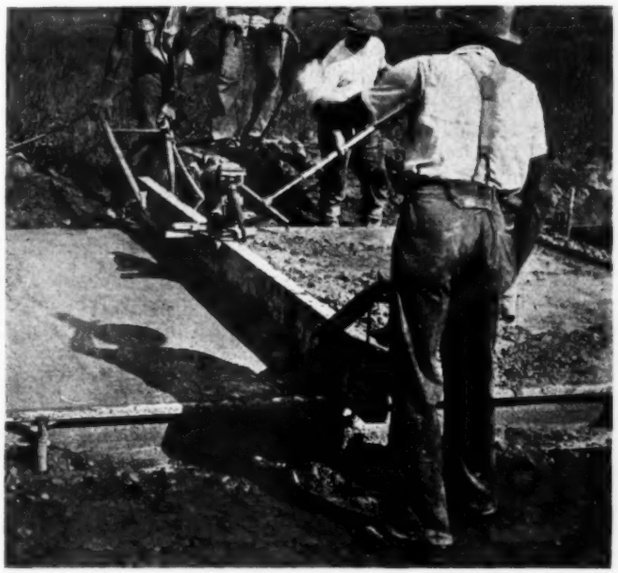
On the Pacific Coast a machine was developed with a vertical vibratory element operating on the end of the slab instead of on the surface. In other localities electric or pneumatic vibrators attached to finishing machine screeds or to hand screeds were used.

Concrete that is to be vibrated, is mixed much drier than concrete finished either by hand or by a finishing machine. About a ½ to ¾ in. slump is commonly used. That makes possible either a high strength, with the same cement factor, or the same strength with a lower cement factor.

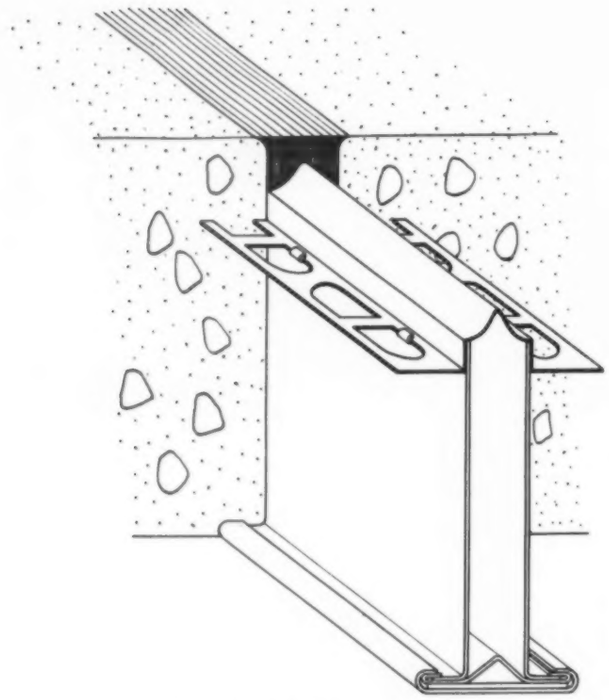
Using the same cement factor, a water cement ratio of about 1 gal. per sack less, is possible for concrete pavements, with a corresponding increase in strength of about 1500 lbs. per square inch in compression at 28 days.

If the strength is kept the same, about one less sack of cement is required per cubic yard of concrete. In other words, a leaner mix can be used in vibrated concrete without reducing the strength. Such a mix, when vibrated, produces concrete that expands and contracts less than the more common paving concrete—a further advantage for pavements.

Although vibration of pavement must still be con-



An Electric Vibrator on a Hand Screed, Used in Compacting Pavement



A Composite Sketch, Showing the General Features of Several of the New Metal Joints

sidered in the experimental stage there is indication that it will some day be the popular method of finishing.

New Curing Mediums—There was also a definite trend toward the use of cotton or felt blankets for curing. In some instances the blankets were used for the entire curing period while in others they were put on for the 24 hours immediately following finishing.

The felt blankets consisted of a layer of this material sandwiched between open mesh burlap. Some of the blankets were lightly treated with rubber latex to make them stronger and more durable.

The blankets fell into two classes. One was used like ordinary burlap and was sprinkled at intervals to keep it moist. The other was sprinkled before it was laid on the pavement and had an upper layer of rubber, bitumen or similar material which prevented evaporation and made it unnecessary to wet the blanket again. One had an attached rubber sheet that was spread over the blanket after the blanket had been sprinkled.

Double layers of cotton cloth were also used in some localities and proved satisfactory. Heavy cotton blankets, like those of felt, sprinkled frequently enough to keep the pavement damp, proved a very efficient curing medium. Tests by the U. S. Bureau of Public Roads indicate that cotton blankets are as effective as 4 ins. of loose straw in protecting concrete against freezing. (Public Roads, Nov., 1934).

Tests indicated that cotton blankets chemically treated to make them remain damp without sprinkling were not satisfactory.

Neat cement paste was also used experimentally as a curing agent. The paste was sprayed on the surface just following final finishing, the idea being that it would prevent the evaporation of water from the concrete and at the same time produce a harder surface. Test cores drilled from the cement-cured pavement developed compressive strengths only 400 lbs. sq. in. lower than those cured for 10 days with earth and water and 200 lbs. sq. in. higher than those cured for 24 hours with wet burlap.

Proportioning—A few years ago concrete for pavements was almost universally proportioned one sack of cement to a certain number of cubic feet of sand and a certain number of cubic feet of coarse aggregate. Job changes in proportions were not permitted. While results with such proportioning were generally good, so far as the quality of the pavement was concerned, poorly graded materials occasionally resulted in harsh and porous concrete. More often, with well graded aggregates, the mix was over sanded, which meant an uneconomical concrete and one that might have an objectionable layer of mortar on the surface. Today the trend is toward the design of mixes, either by water cement ratio, void cement ratio, or methods combining some of the points of both. Even when mixes are not actually designed, the proportion of cement to total aggregate is frequently specified and the engineer in charge of construction adjusts the percentages of fine and coarse aggregate to secure the best possible proportion.

The use of two sizes of coarse aggregate has become almost universal in state highway construction and is gradually being adopted for city work. Some states even use three sizes, the smaller size ranging from ¼ to ¾ in., the intermediate from ¾ to 1½ in., and the large size from 1½ to 2½ or 3 ins. There are two advantages of separate sizes of coarse aggregate. The first is the elimination of segregation, the almost uniform sizes separating very little when piled. The second, and perhaps greater, advantage is the more accurate grading of aggregate that is possible and the resultant reduced cement factor or increased strength.

Soil Studies—A preliminary study of subgrades is becoming the procedure of most highway departments. Standard subgrade tests are carried on to determine objectionable soil characteristics and in those rare instances where these are found, the objectionable subgrade is removed or its characteristics are altered by treatment.

Advances in Design—A dozen years ago pavements were designed by rule of thumb. Then a formula was found applicable to concrete pavement slabs which made it possible to design them to support any given load. But it was not until the last days of 1933 that the formula for slab thickness was refined so that it would apply to all pavement conditions and methods were developed which took into account the volume as well as the weight of traffic using a road.

During 1934 this refined method of design was adopted by several highway departments, resulting in marked economy.

Joints—Joints have recently been of great interest to the concrete pavement designer. In the earliest pavements, joints were installed at very close intervals. At Bellefontaine, O., for example, the pavement was divided into 8-ft. squares by longitudinal and transverse joints. From this beginning the joint interval was gradually increased until finally transverse joints were abandoned entirely by many states. Joints had been a continual source of trouble because of improper construction methods and it was argued that if they were omitted the pavement would be smoother riding and at the same time cost less per mile.

The omission of transverse expansion spaces resulted in an occasional small area where the pavement was shattered or where two slab ends were lifted above grade by the forces of expansion. These blow-ups do not occur very frequently, averaging about one every three miles in pavements built without expansion joints. Repair of infrequent blow-ups costs considerably less than installation and maintenance of regular expansion joints. From the standpoint of economy alone, therefore, joints can not be justified. When no joints are

used contraction cracks form at more or less regular intervals but these are no more difficult to maintain and no more objectionable than joints. In spite of this, the trend is definitely toward joints and they are now required on all Federal Aid projects.

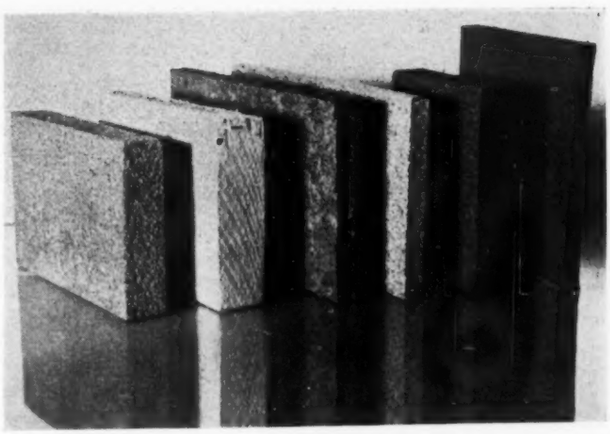
Joint Fillers—For several years there has been considerable dissatisfaction with the ordinary bituminous joint fillers, because they are plastic rather than resilient. They are forced from the joint as the joint closes and form an objectionable bump on the pavement. Then when the joint opens, with contraction of the slab, bituminous fillers do not expand to keep the joint completely filled and a space is left through which water can percolate to the subgrade or into which sand and dirt will find its way, eventually mixing with the joint material and making it so solid the joint can no longer close.

Some type of joint filler has been sought which will keep the joint permanently filled and thus prevent the entrance of both water and solid matter. For a good many years flexible copper sheets have been used to make joints watertight in bridges and buildings. These have been applied to concrete pavement and several copper cap joints are now on the market. They differ in minor details but are essentially the same. In each, a copper sheet with enough slack in it to provide for opening of the joint, spans the joint and is anchored in the concrete on each side. The copper cap is supported during construction by sheet metal plates which act as a form that excludes concrete from the joint space. A plate closes the bottom and ends of the joint, to prevent infiltration of soil from the subgrade and shoulders.

Several fillers have also been put upon the market that can be compressed without extruding and that will expand again as the joint opens, thus keeping the joint space filled, provided the joint does not open to a greater width than it had when constructed. Although theory indicates that early contraction of the slab should widen the joint soon after construction, observation indicates that the expansion space is seldom, if ever, wider than when built.

The resilient fillers that have been proposed are rubber, cork board, Celotex impregnated with bitumen and sold under the name of "Flexel," and a very porous wood called "Balsa," grown in Central America. In the south-eastern states dry cottonseed hulls, impregnated with asphalt, have been used as joint filler with great success and in Texas sawdust is the popular joint filler, where it has been used on more than 1,000 miles of concrete pavement. The sawdust joint is topped by a thin layer of poured asphalt.

Dowels—Dowels have long been used to make slabs work together in supporting loads but the design for dowels has been in question. The older specifications called for a length of 4 ft. and a spacing of 3 ft., and usually ¾ in. round plain bars. Both tests and calculations indicate that these dowels were longer than they needed to be and a length of 2 ft. has now been adopted. The distance between dowels was found too great and a spacing of 12 to 18 ins. is now preferred. The round bar has too little bearing on the concrete and has a tendency to crush the concrete beneath it under heavy, repeated loading. The trend is therefore toward the use of rolled shapes such as angles, T-bars or channels. These greatly increase the bearing on the concrete, are considerably stiffer than an equal weight of round bar, and therefore transmit load better than the round bar does.



Cork, Wood, Rubber and Celotex Are Now Used as Joint Fillers

Dowels have too frequently been put in carelessly so that they were not perpendicular to the face of the joint. Dowels at an angle with the joint keep the joint from opening or closing and defeat its entire purpose. When this occurs the forces of expansion break the concrete above and around the dowels or may even cause a blow-up. Several highway departments now require that dowels be held in a rigid framework that is left in the pavement, to assure dowel installation parallel to center line and surface. Other states have designed a supporting plate that crosses the joint at the bottom. Plates are made to dove-tail in such a way that each slab end rests on the plate from the abutting slab.

Permanent Traffic Lines—Permanent traffic lines are also a recent development. The lines are made by casting white concrete into a groove about 1 in. deep, left in the pavement. The white concrete is made with white cement, white sand, and, in some localities, white stone chips.

The groove is made by pressing a board into the newly deposited concrete. The white concrete is deposited before the concrete of the slab has begun to harden. The surface is troweled smooth, then corrugated, to make it reflect light readily.

A traffic line made by dusting dry cement-sand mortar on the newly finished concrete and troweling it in, has also been suggested.

Either the cast line or the dusted on line can be colored if desired.

Cement Bound Macadam—Cement Bound Macadam increased immensely in popularity during 1934, nearly three times as much being built as in 1933. It was found especially desirable for driveways, for bridge approach sections on which paving had been omitted when the rest of the highway was paved, for secondary highways and for streets.

Permanent Traffic Lines of White Concrete in a New Jersey Highway

Hand Tamping a Cement Bound Macadam Pavement in Savannah, Georgia

One of the developments in its construction was the use of marginal edge bars which had previously not been tried. It was found that these could be readily installed and it is probable that they will be used on much future construction. The ordinary deformed metal plate, with tie bars, was also used for center joints. It was found that the tie bars could be readily inserted after the loose stone had been spread.

In Savannah, Georgia, hand broken brick and hand broken cobbles, taken from old, worn out pavements, were successfully used as coarse aggregate. In this way men were given employment and a minimum expenditure was required for materials.

The use of an old style finishing machine with tamping template was also tried and a very smooth riding surface was reported secured with it. Vibration was also tried on cement bound macadam and some developments of that nature are looked for in the near future.

In spite of these experimental developments in the mechanical finishing of cement bound macadam the trend seems to be definitely toward hand tamping instead of rolling. That is because of the superior riding surface secured when a longitudinal hand tamp was used.

In a year when pavement construction of all types was at a low ebb, improvements in construction methods and design of concrete pavement indicate a keen interest in this subject.

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"No Passing" Zones on Trunk Highways

In a new effort to reduce accidents on sharp curves, bad hills and other places of unusual hazard, the Minnesota State Highway Department will soon establish "no passing" zones on trunk highways.

Such danger zones will be indicated by a double center stripe in the middle of the highway, as contrasted with the single center stripe in general use. Signs at the roadside will carry the "no passing" message.

Engineers are now making a survey of locations on the main routes where passing restrictions are needed. In general, such locations will be on approaches to the crest of a hill where the clear view ahead is less than 500 ft., and on all curves with a radius less than 600 ft. or where the clear view ahead is less than 500 ft.

At places of extreme hazard, special reflector button markers may be placed between the double center lines to emphasize the danger at night.

Many head-on collisions result from cars attempting to pass others while the drivers cannot see far enough ahead to insure safety.

Sand and Gravel Excavation

Factors affecting the technical problems involved in sand and gravel excavation are presented in a circular by J. R. Thoenen, Senior Mining Engineer, just issued by the U. S. Bureau of Mines, Department of the Interior. The circular, designated as part 1, is the first of a series analyzing technical problems involved in the use of different types of excavating equipment as applied to sand and gravel deposits of various physical characteristics.

The discussion in part 1 is confined to a general statement of the factors affecting excavation in deposits of different type and the use of the power shovel, dragline, and excavator crane. Parts 2 and 3 to follow will discuss other types of equipment.

The circular deals with each excavating unit on the basis of its operating characteristics, working range, structural limitations, service equipment required and range of theoretical and actual working capacity. Working ranges and capacities are given in the text and condensed in tabular form for easy reference. The differences between theoretical and working capacities are emphasized and methods of calculations from easily ascertained data are explained.

Further details are given in Information Circular 6798, Sand and Gravel Excavation, Part 1, copies of which may be obtained free from the United States Bureau of Mines, Department of the Interior, Washington, D. C.

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Right of Way Agents Form Association

The Southern California Right of Way Agents' Association held its third meeting on Dec. 5, at the Rosslyn Hotel, Los Angeles, and had a roll call of 63 active members; all of whom were also charter members.

The purpose of this unusual society is to promote the highest standards and co-operative spirit among its members, and to create a perfectly harmonious and friendly feeling between members and their respective employers, as well as for the members' mutual protection and advancement. The floor must refrain from discussing political and religious subjects.

The association is made up of three classes of membership; the active member being one actually employed in the obtaining of rights of way to be used for a definite purpose. The associate member being one who has to do with the searching of titles, such as a title or trust officer of any banking or title and trust institution. The Honorary member is some man of distinction having to do directly or indirectly with the acquiring of rights of way, and this may include mayors of cities or railroad presidents and executives.

The meetings of the association are held at luncheon from 12 to 1:30 P. M., on the first Wednesday of each month. The members represent all the large corporations of Southern California, many municipalities, public utilities, railroads, title companies and banks.

The officers just elected to carry on through the year 1935, are as follows: Frank C. Balfour, Right of Way Agent for the California State Highway Department with offices in Los Angeles, President; George A. Mitchell, of the Los Angeles County Highway Department, Vice President; Ralph F. Beegan, also with the Los Angeles County Highway Department, Secretary, and H. S. Swearingen, of the Los Angeles City Right of Way Department, Treasurer. It is expected the society will have 100 active members by its next meeting to be held the first week in January, 1935.

DESIGN OF BRICK SURFACES TO OBVIATE SLIPPERINESS

By GEO. F. SCHLESINGER
Engineer-Director,
National Paving Brick Association

DEVELOPMENTS of recent years in the use and production of vitrified brick as a paving material that have a direct bearing on the anti-skid properties of brick pavement surfaces are two in number:

(1) The surface removal method of bituminous filler application.

(2) The vertical fiber lug type of paving brick.

The effect of these requirements in brick pavement construction on the character of the resulting paving surfaces, and recent research investigation of filler materials that will further improve the anti-skid qualities of brick surfaces will be considered.

Surface Removal—The flexible or so-called soft filler, has superseded the rigid type for most brick pavement construction because of certain inherent advantages. Difficulties incident to temperature changes are obviated and the joints are sealed against the entrance of moisture. The asphalt filler called for in standard specifications in its physical properties for years had met the requirements of good construction. However as the average speed of highway traffic increased there arose complaints regarding accidents alleged to be caused by the slippery condition of pavement surfaces of all types especially in wet weather. In investigating brick pavements concerning which there had been complaints of slipperiness in wet weather it was invariably found that the surfaces were covered with asphalt in which the mineral cover material had not been properly incorporated. In order to secure an asphalt of the proper consistency for a good filler it was necessary that it have low ductility. The use of such a "short" material called for prompt action in the application of the cover material to insure its proper incorporation in the surplus asphalt left on the surface. When this was lacking the result was a non-gritty slick surface particularly when in a moistened condition. Old brick pavements on which the asphalt had been worn from the surface through the action of traffic were not slippery. It therefore seemed highly desirable to construct a brick pavement so as to have the surface free of filler.

Fig. 2—Pouring the Hot Asphalt Directly Into the Joints of the Vertical Fiber Lug Brick Without Spreading or Squeegeeing, Which Insures Complete Penetration and Sealing

Fig. 1—Applying the Adhesion Preventing Solution in the Form of a Fine Spray Just Before Applying the Asphalt Filler

The specifications for the brick pavement on the Beaver Street viaduct constructed in Jacksonville, Florida, in 1929 required that the joints be poured by hand and that no asphalt be left on the surface. The contractor requested permission to accomplish the results desired by brush painting the surface of the brick with whitewash and then cutting the excess asphalt from the surface. A test produced more desirable results than by the hand pouring method and the permission was given. In 1931 the whitewash method was used on the Washington Street Memorial Bridge pavement in Wilmington, Delaware. In the original and usual method of using whitewash the coating on the surface is allowed to dry and forms a hardened separating layer. If this film is undisturbed the pouring of the asphalt filler may be postponed for days. Because of the lasting nature of the film it is necessary to prevent the whitewash from entering the joints.

In 1932 on a brick pavement project constructed by the Ohio Highway Department the whitewash solution was applied by means of a hand operated air pressure tank through a nozzle that produced a fine fog-like spray which moistened the surface only with little leakage into the joints. Instead of waiting until the application had dried the asphalt filler was applied at once and as it began to cool and congeal was cut off in rolls with tools such as are used to cut ice from sidewalks. After considerable experimenting with various fluids a calcium chloride solution with a slight laundry starch content has proved itself to be well adapted as a separating medium, and is now the material usually specified and used. The calcium chloride and starch produce a slightly gelatinous solution that resists evaporation or quick drying. In this method the separation is facilitated by a moist film on the surface rather than by a hardened coating. If the cutting operation is delayed too long the asphalt on the surface cannot be removed. The contractor soon learns by experience the proper time to begin the removal operation which varies principally with the air temperature. The temporary nature of the prevention of adhesion makes the slight moistening of the sides of the brick, which sometimes occurs, of no serious

Fig. 3—Removing the Filler by Cutting (Not Rolling) from the Surface, the Surplus Asphalt Being Reheated and Reused

consequence. There may be "bubbling" when the hot asphalt is poured into the joints but this merely denotes the escaping of steam into which the adhesion preventing fluid has been converted. Care should be taken to remove the surface asphalt by cutting instead of rolling so as to avoid pulling from the joints.

A few engineers have preferred the hard coating whitewash method as it permits delaying the removal of the asphalt until it has cooled. There is then no settlement in the joints. However in view of the subsequent extrusion that occurs a preference on this score would not seem logical. With the moist film calcium chloride method there is not as much trouble with sediment in the asphalt kettles resulting in frequent cleaning and possible burned out bottoms. Also the surface shows no effect of whitewash stain which however, of course, disappears in a few weeks. In either method the asphalt is poured direct into the joints at a high temperature with no spreading or squeegeeing to cause it to cool before entering the joints. Thorough penetration to the bottom of the brick is secured. No particular care is necessary to secure a thin coat of asphalt on the surface and, as a matter of fact, a rather heavy coat facilitates removal. The reclaimed asphalt can be reused, the usual requirement being that it should be combined in approximately equal parts with new material. Reusing of course increases the heating costs somewhat. The immediate result is a brick pavement clean of asphalt with flush well-filled joints. Because of the saving in asphalt and the elimination of the covering of screenings or coarse sand the use of the surface-removal method does not entail additional cost.

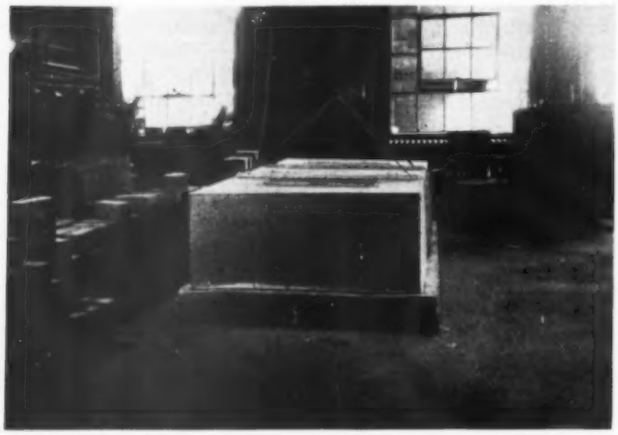
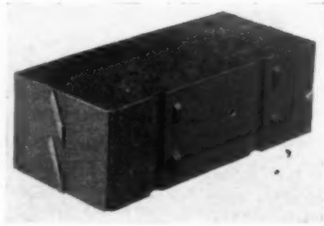


Fig. 5—Metal Hood Covering Brick Pavement Panel, with Thermostatically Controlled Electric Heat Raising the Temperature on a Definite Schedule, to Simulate Service Conditions

Vertical Fiber Lug Brick—Paving brick are formed by what is known as the "stiff-mud" process of clay products manufacture. The shale or clay after being ground very fine is thoroughly mixed with water to the proper consistency. A powerful auger then forces the stiff mixture through a die on to a moving belt in the form of a column. This column is carried to the cutter where taut piano wires automatically cut it into brick units. In so-called vertical fiber paving brick the width and length are determined by the dimensions of the die and the depth by the spacing of the wires on the cutter. In the wire cut lug type the depth is the shorter dimension of the die and the lugs are formed by an eccentric motion given to the cutting wires. In this type the smooth or die side of the brick was in the surface of the pavement. When the brick are repressed before burning the surface is also smooth. It has always been considered desirable to have the rougher wire cut face of the brick in the surface, particularly since in recent years anti-skid properties of pavements have become important. At the same time, from the standpoint of proper filling and sealing, lugs were considered essential by most engineers. Until about three years ago, with the raw material used at most plants, the manufacture of vertical fiber brick with the proper type of lugs was not commercially practical. The difficulties involved have now been overcome and the vertical fiber brick with lugs is in almost universal use in some sections. According to a survey of paving brick shipments made for the Division of Simplified Practice of the U. S. Bureau of Standards, the vertical fiber lug brick in 1933 constituted the largest single variety being 42.5 per cent of all shipments. Briefly the most popular type of vertical fiber lug brick consists of four small lugs on one side which when piled in the kiln on edge—the most economical method for burning—nest in corresponding grooves. The grooves also assist in the free flow of the filler. Brick without the grooves are also manufactured and meet the usual specification requirements. In either type two bars are formed by the die and the bars are pressed

Lugs with Grooves and Stud End Lugs.

Lugs without Grooves and Beveled Ends.



Lugs with Grooves and Diagonal End Lugs.

Fig. 4—Types of Vertical Fiber Lug Paving Brick

down after the brick are cut forming the four side lugs. The grooves when used are also formed in the die.

With the surface removal method of filler application engineers were given a good opportunity to view the thoroughness with which the side and end joints were filled. The asphalt mat on top no longer covered over the faults in filling. It was noticed that in some cases the usual requirement of beveled ends (bulged) did not insure the results desired. In consequence end lugs are now required by many specifications. The lugs as now designed are on each end and non-meshing, so as to provide for a free flow of the filler. They function equally well when the brick are turned.

The term "vertical fiber" as applied to wire cut paving brick has been a misnomer from a descriptive standpoint and is especially so since the advent of the de-airing process of manufacture. By no stretch of the imagination can the dense homogeneous structure of a de-aired column be considered as having fibers. However, the old term will no doubt persist and long usage has associated it with a certain type of brick. It has been observed that in de-aired brick the wire cut surface is sometimes not as rough as in the non-de-aired unit.

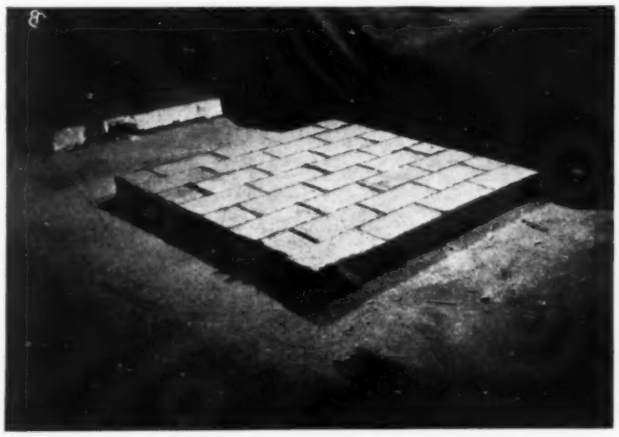


Fig. 7—Asphalt Poured at 350° F. and Heated as in Fig. 6. Notice the Increase in Exuding as Compared with the Panel in Fig. 6.

However any degree of roughness desirable can be produced by the use of deformed cutting wires.

Filler Research—Investigations by Messrs. Stinson and Roberts, reported to the Highway Research Board, indicated that the coefficient of friction, both rolling and sliding on "a vertical fiber brick road, free of asphalt filler" was practically the highest of any of the types that were included on their tests. Observations made by them on the same pavement during the second and third years after completion indicated a measurable reduction in friction. According to their report, this was due to the asphalt progressively exuding from the joints and covering a considerable percentage of the surface. The National Paving Brick Association, recognizing the important bearing of filler exudation on the anti-skid properties of the brick pavement, in December, 1933, began a cooperative investigation with the Engineering Experiment Station of the Ohio State University which had for its purpose the developing of a filler that will be more non-exuding in character than the asphaltic material now in general use.

The work is under the general supervision of Dr. G. A. Bole, Research Professor at the Ohio State Experiment Station, and Dr. W. C. Rueckel, Research Engineer, is in direct charge. Laboratory tests simulated

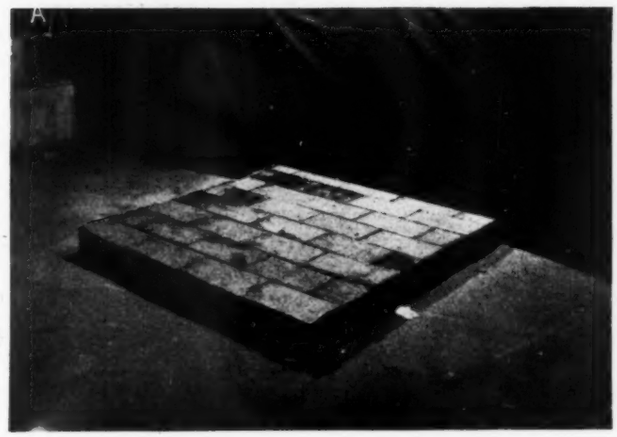


Fig. 6—Asphalt Poured at 410° F. and Heated to 128° F. for 33 Hours Over a Period of 3 Days—Less Exuding Than When Poured at Lower Temperature

service conditions with brick pavements, having joints filled with various materials, constructed in panels and subjected to electrical heat on a definite schedule. The tests warrant the conclusions that:

The exuding of filler can be practically eliminated by the use of a blended asphalt with a high melt point. A type of "plastic sulphur" also proved to be suitable. By the addition of mineral matter to bituminous cement, exuding can be materially reduced. The laboratory findings will be checked in the actual construction of a brick pavement by the Ohio Highway Department to be located on Ohio Route No. 31, the Columbus-Athens road, in Hocking and Fairfield Counties. It is a Federal aid project and there will be 14 sections of brick pavement each about 500 feet in length in which different varieties of fillers will be used. The results in service will be closely observed.

The National Paving Brick Association plans to continue the maintenance of its Research Bureau with a view of extending the usefulness and value of vitrified brick as a paving material.

This article is based on a report presented by the author at the 14th Annual Meeting of the Highway Research Board, Washington, D. C., December 7, 1934.

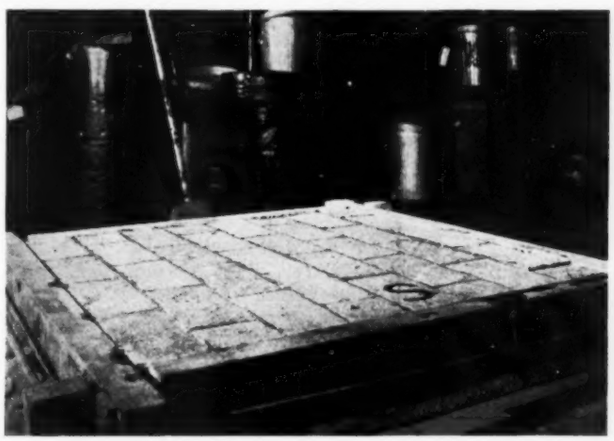
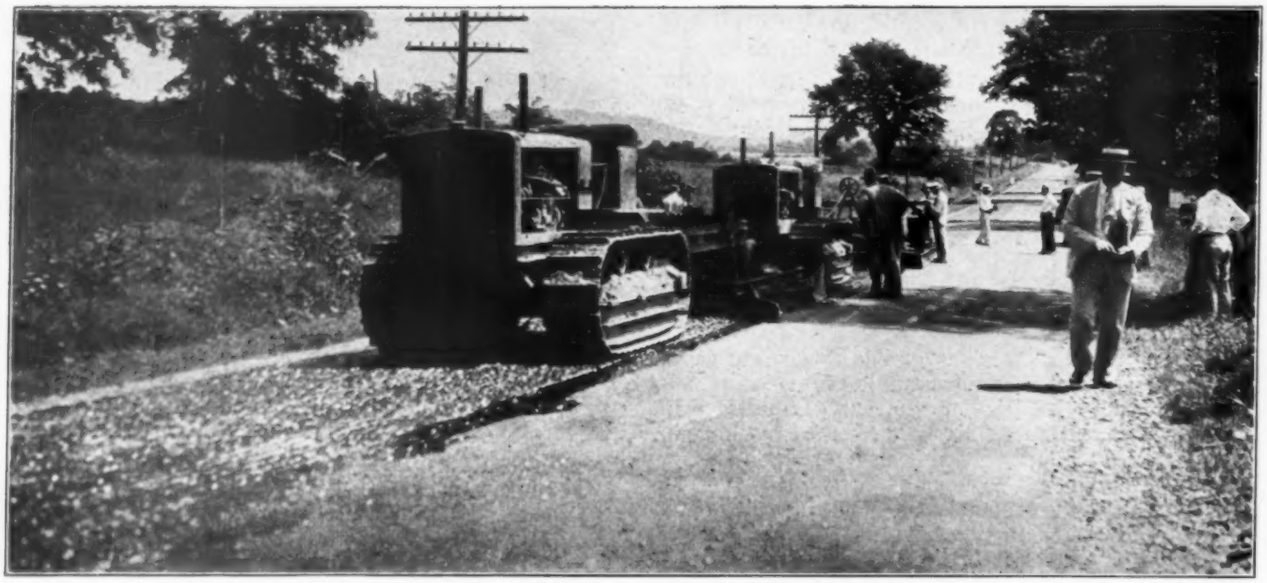


Fig. 8—Asphalt, Produced from Blended Crudes Having Pure Asphaltic and Semi-Asphaltic Bases, with Softening Point (B. & R.) of 220° F., and Penetration Point (77° F.) of 26. Panel Was Heated to 125° F. for 108 Hours Over a Period of 7 Days. Exuding Has Been Practically Eliminated.



The Use of Mixing Equipment in Tandem Speeds Up Work and Enables the Use of Quick Setting Asphaltic Materials

RECENT DEVELOPMENTS IN THE CONSTRUCTION OF ASPHALT SURFACES

By BERNARD E. GRAY

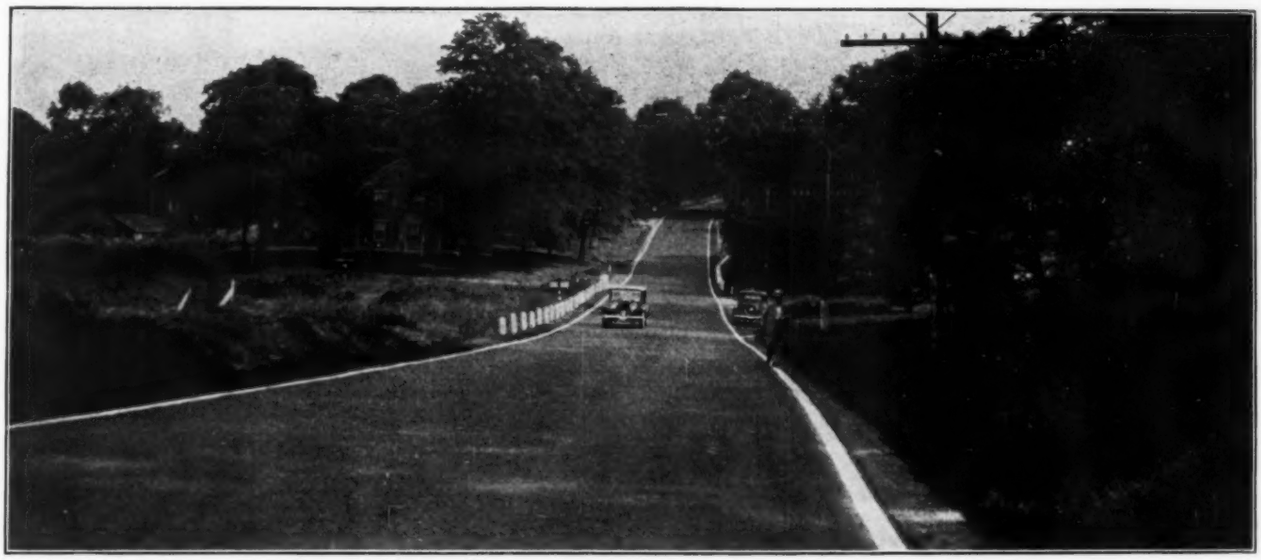
Chief Highway Engineer, The Asphalt Institute

THERE have been three principal developments during 1934 in the design and construction of asphalt surfaces, coincident with the further rapid increase in the so-called low cost types. One is the great advance made in the evaluation of subgrades and the improved technique of utilizing natural inherent values or of adding to such values by changing the character of the subgrade through admixtures of one sort or another. The second is the increased use of new improved equipment and the gradual abandonment of the fallacious idea that by doing all work with hand labor, increased employment would result. The third is the greater control over construction processes, being obtained through rewriting specifications and the insistence upon certain details in order to obtain a smoothness of surface and the skid resisting qualities demanded in the modern highway.

It is only in the past few years that any real attention has been given to the rational design of flexible pavements, although it was common knowledge that very thin sections were carrying loads in many places that under the orthodox method of analysis for rigid structures should have failed within a short time. While it was apparent that some other element of strength was present which made the thin surface a success in one location and a failure in another, it often was dismissed with the remark that the subgrade was good, as though it were an act of Heaven and not to be anaylzed from a technical angle. Then a few states began to make soil surveys, and here and there engineers became bold enough to construct quite long mileages of thin bituminous surfaces based upon an evaluation of natural subgrade support. The failures have been surprisingly few, and during 1934 one finds that a large part of the programs of technical highway meetings have been devoted to study of such work. In the field of research, the work of Hogentogler of the U. S. Bureau of Public Roads, and Housel of the University of Michigan have been especially notable, and every highway engineer should inform himself concerning their studies.

In regard to the use of equipment, one must stand amazed at the way in which hand labor was substituted for operations that had for many years been accomplished by machinery. It is difficult to even approximate the waste that has occurred through such a mistaken policy. One would think that equipment grew on bushes, repaired itself, and never required any touch of labor, as he observed the restrictions placed upon the use of mechanical devices and prepared construction materials. Fortunately, in the latter part of 1934 the sheer fallacy of such a policy began to be apparent, and new equipment was seen on a number of jobs. Better work is obtained as well as a larger amount, while in the factory labor is back at work once more.

It is in regard to the third development that a little more detailed comment will be made, viz; the closer control over construction methods in order to obtain the quality of surfaces demanded and required by modern traffic. By quality is meant smooth riding and safe riding, and a surface which does not furnish them is an



New York-Albany Post Road Near Rhinebeck. Plant Mix Surface. White Line at Edge for Night Driving

inferior one. In order to appreciate the marked changes that have taken place, a brief review will be given of early practice, and then contrasted with those of present day.

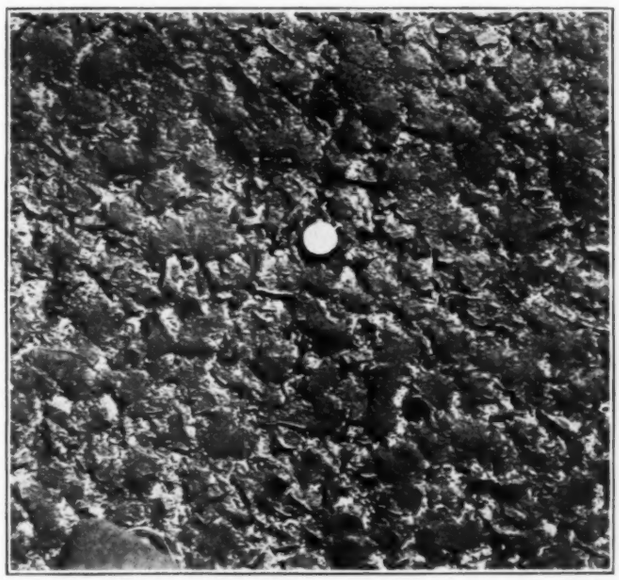
Influence of Early Practice—Asphalt pavements have a long history and because of the great variety of ways in which asphaltic materials may be used, there has been some confusion as between different types of surface. The first asphalt pavements in America were rock asphalt, soon followed by the sheet asphalt types similar to those employed today. Practically all such pavements were in cities and as the traffic movement was relatively slow the need for either very smooth or non-skid surfaces was not felt. As a matter of fact some effort was made to obtain an extra "slick" surface, so that it could be washed and kept free from the dust and dirt brought in by horse-drawn traffic. Even today, especially in the crowded streets where traffic movement is still relatively slow, the need for easy cleaning is an important consideration, and still influences design and construction practice.

The early improved rural roads were composed almost entirely of gravel or waterbound macadam, and to facilitate drainage were constructed with excessive crown, often as much as ¾ in. per foot. Naturally there was no superelevation on curves. These roads were built for a traffic speed of 15 miles per hour or less, and both from the standpoint of safety and durability were quite satisfactory, even for the early automobile. As motor cars increased in number, the most apparent undesirable characteristic in the existing roads was dust, and all early improvement was directed toward its elimination. High speed or crowding were not yet important factors, and in consequence no attempt was made to modify the road crown or to improve alignment.

High Crown Harmful—It then was learned that a dustless surface could be most cheaply obtained by placing a carpet coat of bituminous material and within a short period thereafter practically all macadam roads were thus covered. The bituminous materials preserved the surface, but they also preserved the high crown and the reverse elevation on curves, so that when speeds later increased this unchanged design of cross section became a source of danger.

Use of Inappropriate Material—Also in these early treatments little attention was paid to a proper technique of doing the work. In fact very little was understood about it. Where asphalt was used the material was almost always a residual oil. The writer recalls very well his own experiences in handling surface treatment work in 1909 when the procedure was to fill the pot-holes nearly full of this oil, and then to cover with dust and screenings. This patching was followed by the application of as much as ½ gal. more oil to the square yard, and it in turn covered with coarse sand or sweepings. The natural result was a film of soft oily material on the surface which was practically free of aggregate. During warm weather this material was almost fluid and offered practically no traction when brakes were applied suddenly, and also shoved into ridges and rough areas.

As the number of motor cars rapidly increased, and with continued demand for more improved highways, it was but natural to do the new building on the unimproved gaps, while the already improved roads were continued in use as they were. Even today there are thousands of miles of these original oiled surfaces, although some improvement in surface texture has been



A Correctly Balanced Penetration Macadam, No Surplus Asphalt

made by using more aggregate and harder asphalts in the retreatments.

Asphalt Cement Residues Desirable—Residual oils are still employed in a large volume but usually in a different method of construction, principally in road and plant mix types where a sufficient amount of 200 mesh particles are present which absorb the oily constituents. It is today definitely recognized that the asphalt cement (and by cement is meant one of under 350 penetration), is the correct basis for all asphalt construction. For any class of work regardless of type, the development of an asphalt cement makes for the highest stability and with consequent maintenance of the desired relationship between binder and aggregate, which not only provides for a permanently non-skid texture, but also produces the greatest degree of durability. By using appropriate asphalt cements or liquid materials which become asphalt cements after manipulation has been completed, and by doing the work itself in the light of present knowledge of requisite construction and maintenance procedure, the road surface as constructed remains unchanged under traffic.

This brief review of the transition period between the days of horsedrawn traffic and motor traffic is essential to an understanding of the reasons why such a large mileage of high crowned bituminous roads were in use, are in use for that matter, and only recently are being reconstructed. In the judgment of the writer more skidding accidents occur because of improper crowns than for any defect in surface texture, while because of their greater age more bituminous pavements had these high crowns than any other type. A progressive state engineer recently remarked that when he assumed office there were a number of signs in place on the state highways which read "Danger—Slippery When Wet." He stated that the matter was brought before a division engineers' meeting and it was agreed that the presence of such signs was a reflection upon the ability of the highway department, and that it was their duty to see that such hazardous conditions were remedied. A pavement which is slippery when wet (except for ice) is a pavement which is either wrongfully constructed or is being wrongfully maintained, and it is the duty of the engineer to see that such condition is corrected.

Modern Asphalt Surface.—Over the years there have been gradually developed a variety of types calculated

Mechanical Spreading of Cover Coat Aggregates Prevents Segregation and Produces Uniform Surface Textures

to meet every possible condition of traffic, every kind of available aggregate and every financial limitation. They are listed in approximate order of cost and increasing ability to take traffic.

1. Dust layers
2. Surface treatments
3. Road-mix surfaces
4. Plant-mix surfaces
5. Penetration macadam
6. Block pavements

In general surfaces having the most non-skid texture and the greatest smoothness also have the greatest stability and durability, so that all improvements in technique to achieve the latter qualities produce the non-skid texture as a matter of course. The fundamental principles underlying the design of surfaces are well understood, but the specifications which insure construction in accordance therewith have not yet been universally adopted. Uniformity is all important, and it is essential for proper work, that absolute control of

A Mechanical Spreader for Plant Mixtures on an Indiana PWA Job

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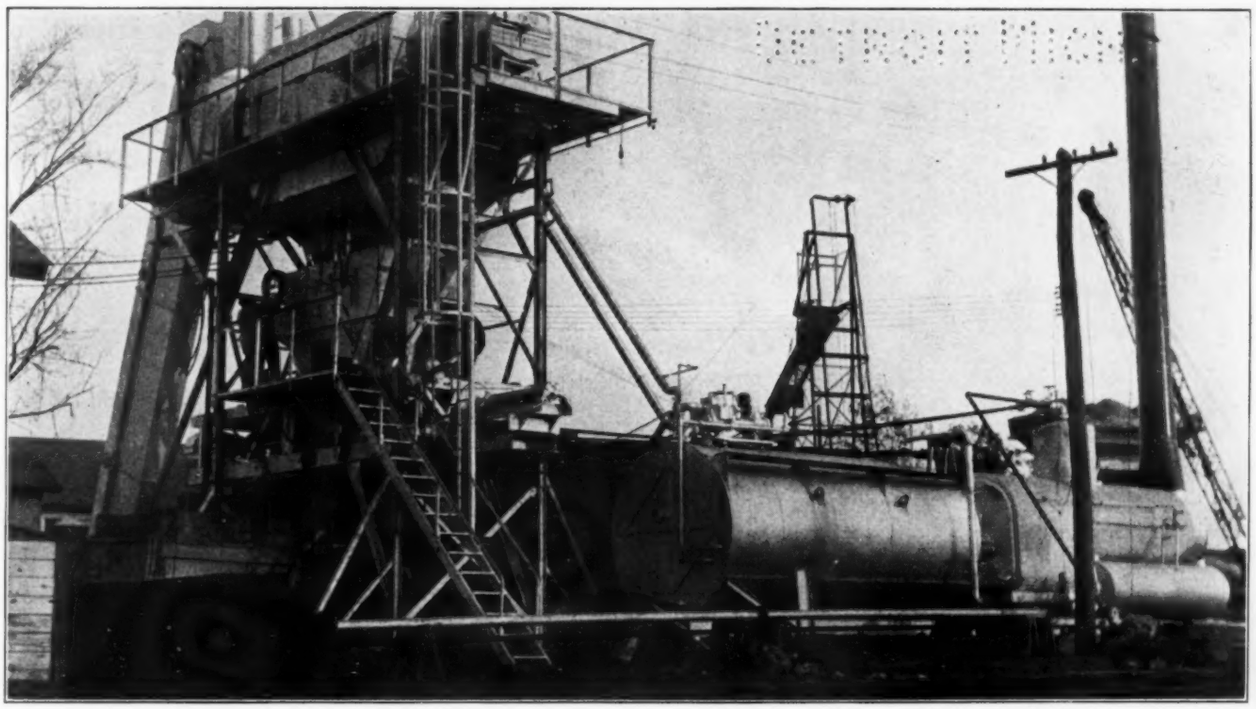


A Modern Asphalt Plant on an Ohio Job

procedure be had at all times within the design limits. The requirements are discussed briefly by types.

Dust Layers.—The first classification is of rather minor importance because the application of dust layer material is usually in small amount, so that the original texture of the surface is unchanged. The principal use is on gravel or traffic-bound macadam roads which are in the process of stabilization and with new aggregate being gradually added where needed. The oil impregnates the dust and prevents its removal from the surface. Light asphaltic oils are used for this purpose and no mat should be formed while the usual maintenance methods of blading and dragging the surface are employed.

Surface Treatments

There are approximately 40,000 miles of surface treated roads on the state highway system alone, and this mileage undoubtedly will be doubled and tripled within the next few years as a result of the very considerable mileage of gravel and other selected material surfacings which have been constructed in recent years. The subject will be treated in two divisions, (1) new surface treatments, and (2) retreatments.

Original Treatment.—Until the last year there was a marked tendency toward the use of large sized aggregate for cover coat with view to obtaining a coarse open surface texture. It is not these coarse fragments, however, that insure non-skid textures but rather the correct relationship of asphalt cement to aggregate, and marked economies may be obtained by giving greater attention to this fact and the selection of the appropriate grade of asphaltic material. In original treatments, the first step is to prime the surface in such a way that the mat subsequently formed will not only be thoroughly knit together but also that instead of simply a layer of bituminous material dotted with aggregate, there shall be an actual impregnation of the road surface. This procedure practically eliminates the possibility of later bleeding or flushing to the surface even under high summer temperatures. For example, in a gravel road treatment, if a heavy asphaltic material is applied without a primer, there is simply a mat resting upon the gravel and not a part of it. Any movement under this mat causes a pot-hole, while in warm weather the excess of asphalt floats to the surface free of aggregate. On the other hand, if this same road is first treated with a priming asphalt, which is entirely absorbed by the road surface there then is prepared a surface structure of such character that the later application of asphalt cement is held firmly in place among the aggregate particles, and any size of cover coat material may be used according to the texture desired.

The selection of the kind of asphaltic material for the seal coat depends largely upon the engineer himself as the same results may be obtained with a cut-back asphalt, an emulsified asphalt or a hot asphalt cement. There are two fundamental considerations: (1) the surface must first be primed, and (2) the material left in place as residue must be an asphalt cement and not a non-volatile material.

Retreatments.—There is a considerable lag between vehicle changes, and maintenance methods to take care of such changes. Ten years ago the heavy units were trucks on solid tires moving at relatively low speeds, and to meet this condition coarse aggregate cover was used to give greater stability so as to resist shoving and impact. By the time this technique was in general use, the motor vehicle had changed to trucks on pneumatic tires moving at high speeds. Too coarse a texture is now difficult to maintain, especially under winter traffic when chains are used and which will tear the coarse particles from the surface, unless the voids between them are filled. There is therefore a distinct tendency toward very light retreatments using smaller sized aggregate for cover, with view to a dense waterproof surface.

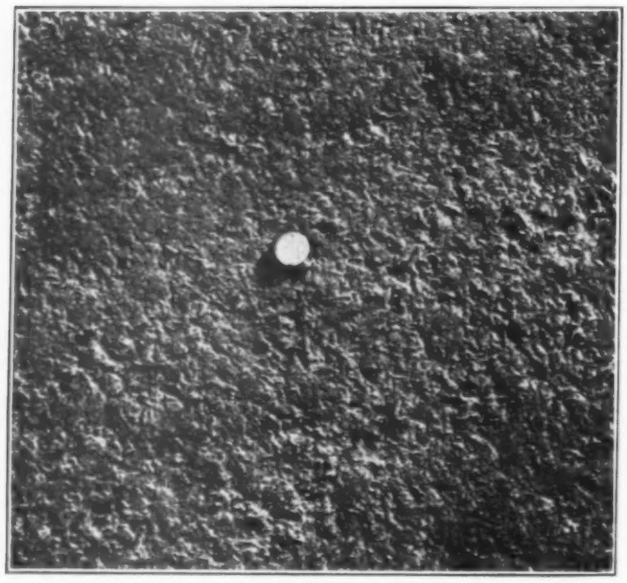
Road-Mix Surfaces

Road-mix surfaces while of recent development constitute a rapidly increasing mileage, not only as entirely new surfaces but also as a means of salvage for old pave-

ments or as a method for removing excess crown and surface irregularities. There are two distinct varieties, (1) macadam aggregate type where the smallest particle is *retained* on a ¼ in. screen, and (2) the dense graded aggregate type where as much as 70 per cent *passes* a ¼ in. screen. The first type is used principally as a resurfacing and salvage medium over old pavements, while the second is employed over either natural soil subgrades or sandy gravel surfaces.

The early work was an outgrowth of surface treatment procedure, with extra heavy applications of bitumen and cover, and with the fault of a non-uniform rate of aggregate with a uniform rate of asphalt, so that very spotty surfaces resulted. Much of the discussion in regard to the amount of asphalt to be used in macadam aggregate road-mix arises from failure to provide this uniform rate of coating on the stone. For example, if an old road is being reconstructed with view to taking out excess crown, as well as irregularities, and the average amount of stone is 160 lb. per square yard, the stone often will be spread in such a manner as to be nearly 4 in. thick at the edge, and less than 1 in. at the center. When followed by the distributor application of the liquid asphalt at a uniform rate, no amount of subsequent mixing will produce as heavy a film around the stone particles in the lower outside layer as will be on the center stone, and the chances are that the surface will be fat in the center and ravel at the edge. The correct procedure is to spread the stone at a uniform rate per square yard regardless of contour, apply asphalt and make the mixture, and then spread the mix to produce the desired cross section. Some very excellent new equipment has been developed in the State Division shop at Chillicothe, O., and work accomplished this past summer shows the value of attention in this respect, not only as to uniform non-skid texture but with less inconvenience to traffic and a lower cost as well.

The early work with the dense graded aggregates was done in the arid or semi-arid regions of the west, under which conditions non-volatile, slow-curing road oils were satisfactory primarily because of the absence of capillary moisture which might force the oil to the surface. Provided sufficient fines (200 mesh) are present to absorb the lighter oils, and there is a correct aggregate grading to produce stability, the oil-aggregate relationship tends to remain constant under constant weather conditions. However, where rainfall is considerable or where severe winter conditions prevail, it is essential that the asphaltic material be of such character as will definitely increase in viscosity to an asphalt cement which will resist displacement. If light oils are used under such conditions, no matter how well mixed, extreme capillary moisture will displace the oil, force it to the surface, when it will appear as though the mix was too rich, and finally the surface will ravel. The medium-curing cut-backs develop the increased viscosity required to resist displacement, and are being adopted universally for such work.



A Macadam Aggregate Road—Mix Surface in Vermont After 4 Years' Traffic

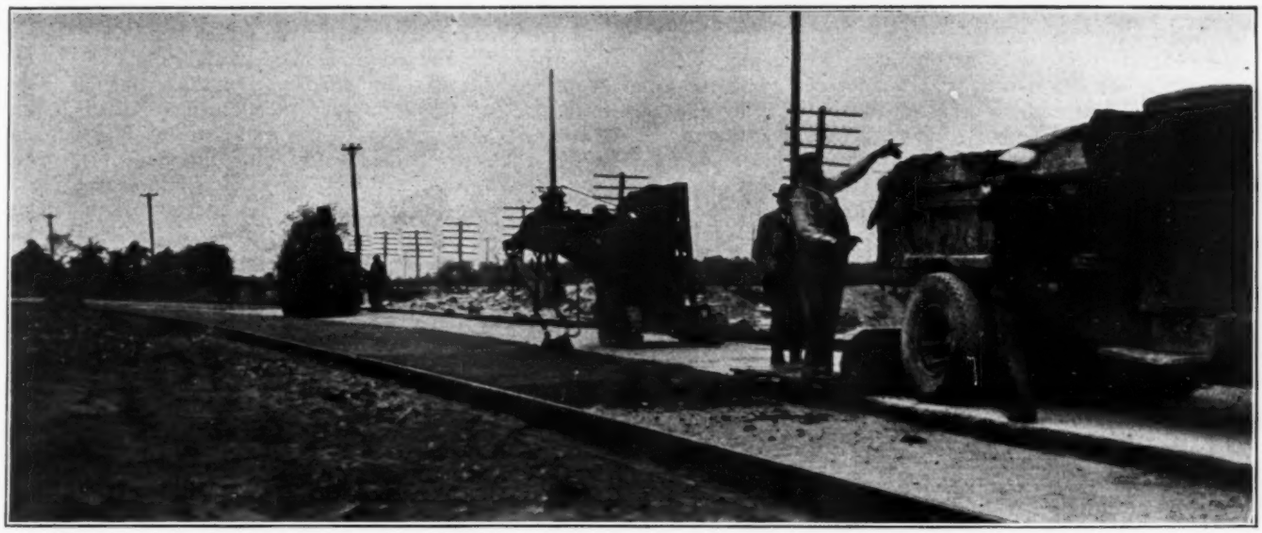
A Well Graded Cover Coat Aggregate Produces a Uniform Surface

In addition to the need for using an appropriate grade of asphalt, is the question of proportion. Too much emphasis can hardly be placed upon the use of the simple laboratory tests that will indicate the correct percentages of material to be used so as to obtain the utmost strength from a given aggregate, and which also insures the maintenance of a non-skid surface. These methods have been set forth in reports of the Bureau of Public Roads and The Asphalt Institute and will not be gone into here, but suffice it to say that by following recommended procedure, non-skid surfaces as constructed will stay that way.

Plant-Mix Surfaces

Plant-mix surfaces include both the hot and cold mixes of which there are several varieties. They will not be gone into in detail but simply coming back to the fundamental principle of proper relationship between aggregate and cement, several items will be discussed which have bearing upon control of this relationship. It is stated without fear of contradiction that with certain types of asphalt plants, it is a matter of pure luck instead of any engineering judgment that a suitable mixture is manufactured and placed on a road. Assuming that the laboratory design is a proper one and that under suitable test a high stability is shown, the next consideration is to translate this design into day by day construction practice.

The laboratory samples are prepared by weighing the aggregate components and the asphalt cement on a pair of delicate balances. Suppose it is determined, for example, that 7.7 per cent asphalt cement with certain per-



A Lucas County, Ohio, Job. Showing Mechanical Tamper in Center for Consolidating Areas Not Reached by a Roller

centages of aggregate will produce the most desirable mixture and that when the percentage of asphalt is materially greater or less than this amount, a lesser stability is obtained and which usually means a less non-skid surface. In spite of such knowledge the asphalt plant used for the large scale manufacture of the mixture may not be controlled within ten or fifteen per cent. This may sound like a startling statement but to anyone who has inspected a number of asphalt plants and followed the mixtures as they come to the road it is simply a statement of fact. Happily there has been a tendency in the last year to revise specifications so as to require certain minimum plant essentials. It is obvious that in addition to having the right total relationship between asphalt and aggregate, there should be also a uniform distribution of both asphalt and the several sizes of aggregate throughout the entire mixture as otherwise there will be alternately fat and lean spots, and the fat spots will not have the same qualities as the remainder of the pavement.

Accordingly, the first essential in plant control is the prevention of segregation of the different sizes of aggregate. In many plants aggregates are dumped into the drier without any attempt to introduce even approximately correct proportions. The aggregate then goes from the drier to the hot elevator and to the screens where the surplus of one or more sizes may prevent proper separation. Even if this does not occur the bins may be either inadequate in number or in capacity, so that as one size builds up a surplus, another size may be lacking entirely. Furthermore, the bin construction may be of such character as to permit overflow from one bin to another, so that all the value of screening has been lost. The specifications should provide for mechanical feeding of aggregates in appropriate proportions and with screening devices to obtain complete segregation, with subsequent storage in bins so constructed that overflow from one to another is impossible. There is some trend in the use of square mesh screens of the vibrating type in place of the old circular screen.

Having separated the aggregates into the proper sizes, recombination to make the total amount in the mix is then required, and the use of spring balances or single beam balances is not in accord with the exact procedure which should accompany modern mechanical methods. When the beam type is used there should be a separate beam with tell-type indicator for each size aggregate, and a tare beam for balancing the hopper, so that there is assurance of exact proportions.

In many old plants, the weighing of the asphalt is done in a very crude manner with wide variation between batches. Furthermore, with the asphalt bucket exposed to the wind, chilling on one side affects the amount actually deposited in the mixer. These variations may be all overcome by providing that the bucket shall be either steam jacketed or insulated, as well as the pipe lines which lead to it, and that either dial or beam scales be used so that the tare weight of the bucket and the net weight of the asphalt are exactly shown for each batch. Scales for aggregate should be sensitive to ½ per cent of maximum load required, while for the asphalt they should measure accurately within 1 per cent (of the asphalt) above or below the weight required.

Being assured of the proper amount of asphalt and aggregate in the batch, the next step is to obtain proper mixing of the two materials. This may be accomplished by providing that the mixer box be of proper construction, so that it will not leak during mixing, and will dump the mix without segregation at completion. Furthermore, it should be equipped with a time lock to insure accurate control of the mixing cycle. Modern mixer boxes are made nearly square and with the gates extending across the entire bottom, so that the mix is dropped as a whole mass. With equipment and control of this character, batch after batch is of uniform composition and is delivered to the roadbed in a uniform condition. As regards finishing, hand raking and spreading are used in many cases, particularly for city construction, but mechanical finishing is replacing hand methods and is to be encouraged, as there is no comparison in the quality of the work obtained by the two methods. However, it is not the hand raking that causes non-uniform surfaces but rather the non-uniform manufacture, and if the plant requirements as above outlined are insisted upon, little difficulty will be found in obtaining a uniform granular surface.

One desirable item in connection with sheet asphalt specifications is the elimination of the requirement for an application of dust over the compacted wearing course. It serves little or no useful purpose and materially reduces the natural non-skid characteristics of the mixture. Furthermore, this application often is made to cover up poor work before final inspection, which is an additional reason for its elimination.

In addition to obtaining a highly non-skid surface by following careful construction methods, additional non-skid characteristics may be obtained by placing a light seal coat. This consists of a hot precoated aggregate broadcast over the surface after the initial rolling, and imbedded under the final rolling. The rate of application is from 8 to 10 lb. per square yard, size of aggregate ¼ in. to ¾ in., the asphalt coating from 1½ to 2 per cent, applied at a temperature of not less than 275° F.

Penetration Macadam

This type is one of the oldest varieties of bituminous pavement, and was widely constructed as a high type pavement on rural roads around 1910 to 1915. Originating in the northeastern states where very hard stone was available as well as a good construction technique, the type was later adopted in other sections where sometimes because of the lack of one or both qualities, very inferior work was obtained. It is fundamental to good results that the stone be of a quality and be so placed that the voids between the stone particles will be uniformly open, so that a given rate of application of asphalt will be uniformly absorbed. If the stone is soft these voids will be non-uniform after rolling, and fat spots will be certain to develop. For such aggregates a different type of surface should be designed.

In the last few years there has been a revival of the type on a large scale as a result of its excellent service record, and long lived qualities. The principal fault in the early construction was the practice of applying a heavy seal application of asphalt with fine aggregate cover, which coupled with a high crown made a surface which was unsatisfactory under fast driving in wet weather. These faults are eliminated today by following a revised design, particularly as to certain details. First, the thickness of wearing course is made 2½ in. instead of 3 in. as formerly. Second, the aggregate is coarse, none under 1¼ in. and with the bulk around 2 in. Third, the rate of application of asphalt is reduced to 2 gal. for penetration and 0.4 gal. for seal coat. Fourth, the cover coat aggregate size is increased and the amount diminished. The result is a surface texture in which the coarse particles of stone are sharply outlined as in a mosaic, although the voids between are filled with asphalt. Such surfaces do not bleed, and the wear of traffic comes directly on the stone.

As developed in Massachusetts, the surface is not only non-skid under summer temperatures, but because of the slight valley between stone particles, gives considerable tractive resistance even under heavy ice and sleet storms.

Asphalt Block Pavements

Asphalt block pavements are constructed for very heavy duty service, such as terminal areas, docks, industrial streets, or arterial highways. The blocks are formed under 3,000 to 4,000 lb. per square inch pressure from a special sand asphalt mixture. The early pavements were laid with sand filled joints which gave all necessary tractive resistance, but with the advent of fast motor traffic, it became necessary to fill the joints with a more durable binder, and emulsified asphalt and sand are used today for this purpose. Coupled with the sand texture of the block face there is provided a non-skid texture for ordinary grades. In recent years asphalt block pavements have been constructed on very heavy grades by reason of an unusually high tractive resistance obtained from a new manner of placing the block. This procedure in brief is as follows. First, the blocks are placed in transverse courses with wooden spacers, approximately ⅜ in. wide between. Ordinary building lath are satisfactory. After the street has been laid the spacers are removed and filled with Portland cement grout. About 30 minutes later when the grout has taken its initial set, the joints are raked to a depth of ½ in., which leaves a recess ½ in. wide and ½ in. deep between each row of blocks. This type has been very successful on the heavy grades leading from the Hudson River in New York City, and this method of placing is recommended for steep grades universally.

Conclusion

At the present time a number of states are rewriting their specifications. As the question arises as to how far they shall go in the requirements for improved equipment, closer control of processes, and narrower tolerances, as to smoothness of the finished surface, and as some contractors complain that such new conditions will work a hardship upon them, let it be remembered that wherever such advances have been made, not only have improved surfaces resulted but the cost of construction has been lowered as well. With precision equipment and control efficiency of operation rises rapidly, and the good contractor has everything to gain through the greater degree of control by the engineer.

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Tire Radius Increases Speed of Car

To the Editor:

On page 446 of the December ROADS AND STREETS there is a suggestion for thought relative to the increase of automobile tire radius with higher speeds of car, reference being made to the effective rolling radius, this increase being due largely to centrifugal force. The reported tests indicate a greater increase of radius in the front tire than in the rear. And the editorial question regarding possible slippage under driving force as the cause of this difference would seem to permit discussion.

This apparent deficiency of increase in the driving wheel radius probably is due to a circumferential compression of the rubber immediately in front of the point of contact. Since all tractive effort is applied to the road surface through the tires of the power wheels, there must be a backward push upon the rubber in front of the point of contact and a tension in the rubber to the rear of this point. The result would be an inch length of road contacted by an inch of compressed rubber which normally forms somewhat more than an inch of tire perimeter. For higher speeds, greater tractive effort is necessary, there is greater compression in the contacting rubber, and there is a greater apparent deficiency in the increase of effective radius compared with that of the freely running front wheels.

Another phase of the matter is the increase when the car is on an up grade. Even when the car is motionless, there is an increase of radius of the front tire and a relatively greater decrease in the rear tire. These differences apparently remain constant for all speeds. Is not this due to the shifting of weight occasioned by the backward tipping of car? And would not the reverse be true when on a down grade? The stated load and air pressure require the rather high contact area of some 35 square inches per tire. Due to the curving of tire, a certain increase of contact area of rear tire would cause a greater change of radius than would an equal decrease of contact area of the front tire. These reflections would seem to be in rough agreement with the actual conditions discovered in the tests.—*Leonard C. Jordan, Consulting and Designing Engineer, New Rochelle, N. Y.*

STATE HIGHWAY CONSTRUCTION IN 1934 AND 1935

Reports from Highway Officials Showing Probable Expenditures

New England States

Maine

It is impossible at this time to give anything more than a rough estimate of mileage completed during the past season, as so much of the work, especially secondary work, is done in connection with the towns. On these projects the towns finance the work and the state highway commission makes reimbursement to them after the work has been completed. It usually takes some time to get all of these reports in and the work tabulated. There are over 500 towns and probably nearly 1,100 of these small projects for which statistics have to be gathered.

It is estimated that in connection with the work on the state highway system during the past year 23 miles of gravel road were completed, 41 miles of bituminous macadam, 8 miles of bituminous concrete and 3.7 miles of concrete. The Commission has started and will carry over to 1935 5.6 miles of gravel road, 6.8 miles of bituminous macadam and .2 of a mile of concrete.

It is estimated that the secondary and third class highway construction will amount to approximately 370 miles of gravel road and that of this class of work approximately 21 miles will be carried over to 1935.

As far as is known now, the funds for secondary and third class work for 1935 will amount to about $2,300,000. The Federal funds from grants carried over for expenditure in 1935 will amount to about $1,300,000.

The new allotment for regular Federal aid is $1,090,167, which will have to met with state funds. It is presumed some provision will be made by the incoming legislature to take care of meeting Federal aid. There is at the present time $1,000,000 of unissued highway bonds and $750,000 of unissued bridge bonds. Whether these funds will be used to meet Federal aid or whether some other provision will be made, it is not possible to say at this time.

No detailed program of highway construction for 1935 has as yet been made up.

Lucius D. Barrows, Augusta, Me., is Chief Engineer, State Highway Commission.

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Vermont

The following tabulation shows the mileage of various types of highways completed in 1934:

Superior to Gravel Construction Completed in 1934

Types	State Highways, Miles	State Aid Highways, Miles	Town Highways, Miles	Total
Concrete	8.15	9.01	...	17.16
Macadam	8.60	12.60	0.23	21.43
Bit. treated gravel	42.04	55.66	1.45	99.15
Total	59.99	79.40	1.68	141.07

On Jan. 1, 1935, an additional 27 miles were under contract but not completed. Details of the 1935 construction program are not available at this time.

H. E. Sargent, Montpelier, Vt., is State Highway Commissioner.

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Massachusetts

The mileage of new state highways laid out during the year amounted to 29.53 miles, but there were abandoned or discontinued 1.33 miles of state highways, so that the net mileage of state highways amounted to 1,852.26 miles on Dec. 1, 1934.

The State Department of Public Works has constructed, reconstructed and widened 85.041 miles of state highways and built 156.648 miles of roads in cooperation with cities, towns and counties under the provisions of chapter 90, General Laws, and, in addition has constructed 62.902 miles of highways under the provisions of Special Acts, in 1934. Under the provisions of section 26, chapter 81, General Laws, the department has had charge of the repair and maintenance of 8,830 miles of public ways, exclusive of state highways in 178 towns.

The Federal appropriation for Massachusetts highways under the National Recovery Act for 1935 is $3,350,474.

No information is available yet as to any additional Federal appropriation or the state appropriation for the coming year.

A. W. Dean, Boston, Mass., is Chief Engineer, State Department of Public Works.

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Rhode Island

During the year 1934, 64.43 miles of road construction was completed, consisting of 11.46 miles of reinforced cement concrete, 4.61 miles of sheet asphalt on concrete base, 11.46 miles of bituminous macadam, and 36.90 miles of surface-treated gravel. Practically all of this construction was financed from Public Works Funds allotted to the State Board of Public Roads under the National Industrial Recovery Act.

The allotment under the second apportionment of Public Works Funds under the National Industrial Recovery Act for the fiscal year 1935 was approximately $1,000,000, and the 1935 program based on this involves the construction of about 26 miles of road, which includes 3.7 R. C. concrete, 9.9 miles bituminous macadam, and 12.5 miles surface-treated gravel.

The Legislature at its regular January-April session in 1934 failed to pass an annual appropriation bill for the fiscal year commencing July 1, 1934. Since June the Legislature has been in special session, but no appropriation bill has been passed and since July 1st state departments have been operating on a monthly basis using one-twelfth of their appropriation for the past fiscal year, as provided by law. The new Legislature will hold its first session January 2, 1935, and undoubtedly one of

the first items to receive consideration will be an appropriation bill.

George H. Henderson, Providence, R. I., is Chief Engineer, State Board of Public Roads.

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Middle Atlantic States

New York

During 1934 the State Division of Highways let 211 contracts calling for the construction of 457.92 miles of highway. This mileage includes 112 bridges, 29 highway grade separations, and 15 railroad separations. The total contract price, including engineering, is $21,452,794.67. Information on the 1935 construction program is not available at this time.

Arthur W. Brandt, Albany, N. Y., is Commissioner, Division of Highways.

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New Jersey

The 1934 program of the State Highway Commission represents work approximating some $12,600,000, $4,600,000 bridges and $8,000,000 for road construction. It is estimated that only about $600,000 of this amount will be expended up to Dec. 31, 1934. Therefore, practically all of the work included in the 1934 program, which theoretically covered the fiscal year between July, 1934, and July, 1935, will be contracted for and perhaps performed in 1935. Undoubtedly some of it will carry over into 1936.

Final data have not been prepared as to the work actually performed during 1934. However, the following figures may be considered as fairly representing the work completed or practically completed during 1934.

51.331 miles of reinforced concrete pavement
1.212 miles of asphalt pavement on concrete base
1.432 miles of bituminous concrete pavement
32 stream bridges
7 highway grade separations over highways
15 railroad grade separations

Work under contract that will carry over into 1935:

31.523 miles of reinforced concrete pavement
5 stream bridges
1 highway grade separation
6 railroad grade separations

Work programmed in 1934 that will not be placed under contract until sometime in 1935:

19.4 miles of reinforced concrete pavement
1.8 miles of asphalt
6.5 miles of macadam
6.0 miles of grading
11 stream bridges
2 railroad grade separations

The above only includes work to be performed on the State Highway System, and does not include the work performed or to be performed by the several counties and townships with State aid.

Pennsylvania

The State Highway Department expended $75,000,000 in 1934 for construction of 2,985 miles of highway, reconstruction of 226 miles and resurfacing 154 miles and maintenance of 84,000 miles. The same amount will be expended for maintenance in 1935, but the construction expenditures will depend on action of the present legislature.

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East North Central States

Michigan

At this time (Dec. 21), all of Michigan's share of the $12,736,227 Federal grant of 1933 has been placed under contract and the work virtually completed, with a few exceptions. Probably ten road and five bridge contracts will be carried over into 1935, on which there will be approximately $500,000 worth of work to perform.

The following types of work make up the 1934 surfacing program:

	Miles
20 ft. concrete pavement	127
Concrete pavement widening	26
Concrete pavement recapping	2
Two-course gravel	196
Asphalt on concrete	10
Brick	.3
Bituminous concrete	29
One-course gravel	57
Crushed mine rock	3
Total	450.3

At present the State Highway Department is placing projects on the U. S. Public Works Highway Program (1935) under contract as fast as possible, and it is estimated that $4,000,000 of work will be under contract before Dec. 31, 1934, leaving approximately $2,500,000 to be contracted for early in 1935. It is believed that about $500,000 on the 1935 program will be earned in 1934.

During 1934 the Department had no state funds available for actual construction work and this situation will doubtless prevail during the first six months of 1935. It is contemplated, however, that state funds will be available during the fiscal year beginning July 1, 1935, to match the Federal funds appropriated at the last session of Congress, of which Michigan's share is approximately $4,000,000. It is believed that at least 60 per cent of this $8,000,000 program can be placed under contract during 1935.

H. C. Coons, Lansing Mich., is Deputy Commissioner-Chief Engineer of the State Highway Department.

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Wisconsin

The State Highway Department has not completed an exact tabulation of its 1934 construction at this writing. It is not possible at this time to give definite statements regarding the 1935 program because it is dependent somewhat at least upon action of the state Legislature, which will meet in January, and somewhat on the release of certain highway funds and other contingencies which have not taken definite shape.

However, the following is a rough tabulation of contracts awarded during the current year and of the tentative plans for 1935:

1934 *Construction*

High type pavement	80 miles	$3,000,000
Low type bituminous pavement	270 miles	1,500,000
Gravel or crushed stone	250 miles	750,000
Grading only	150 miles	1,500,000
Structures		1,000,000
Total		$7,750,000

Tentative 1935 *Program*

High type pavement	160 miles	$ 4,000,000
Low type bituminous pavement	150 miles	1,000,000
Gravel or crushed stone	130 miles	1,000,000
Grading only	400 miles	3,000,000
Structures		2,000,000
Total		$11,000,000

E. E. Parker, Madison, Wis., is State Highway Engineer.

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Ohio

The following tabulation shows the contracts completed in 1934 by the State Department of Highways:

Miles	Type Improvement	Cost
206.694	Concrete	$ 6,481,241.92

72.075	Brick (also furnish and deliver)	4,528,467.85
.....	Bridges	2,384,333.51
45.084	Bituminous concrete	1,109,524.44
30.019	Traffic bound macadam and structure	487,350.18
18.282	Bituminous macadam	371,221.23
273.364	Surface treating	357,659.37
5.354	Grading and draining	356,969.46
19.470	Bituminous surface	167,145.27
.....	Landscaping	1,161.17
670.342	Totals	$16,245,074.40

It is not possible at this time to give the construction program for 1935.

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Indiana

State highway completed in 1934 amounted to 393 miles, involving an expenditure of $9,266,258. The probable mileage of new construction for 1935 is 290 miles and the expenditure $8,000,000.

M. R. Keefe, Indianapolis, Ind., is Chief Engineer, State Highway Commission.

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Illinois

In 1934 the following state construction was completed: Paving, 552.39 miles; grading, 117.4 miles. In addition, 207 bridges were completed. The expenditure for state construction was $24,400,000. The estimated expenditure for state construction in 1935 is $23,000,000.

Ernst Lieberman, Springfield, Ill., is Chief Highway Engineer.

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Nebraska

The 1934 contracts included the following: Grading, 429 miles; concrete, 9.4 miles; bituminous mat and oiled sand, 211 miles; gravel, 511 miles. The cost was $8,980,000. It is estimated that the construction expenditures in 1935 will amount to $5,000,000.

A. T. Lobdell, Lincoln, Neb., is Chief Engineer, Department of Roads and Irrigation.

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Minnesota

The State Highway Department completed 66 miles of paving in 1934 at a cost of $1,650,000; 326 miles of grading at a cost of $1,800,000; 488 miles of graveling costing $730,000; 420 miles bituminous surfacing at $1,100,000; 67 miles water-bound macadam base at $900,000; 47 miles shouldering at $70,500; and 54 bridges at $800,000. Construction mileage and expenditures in 1935 depend on action of state legislature, which is now in session.

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North Dakota

During 1934 mileage completed by the State Highway Department included the following: Earth grade, 674 miles; gravel or equal, 404 miles; oil mix, 93 miles; paving, 14.7 miles. The road program for 1935 is estimated to be as follows:

Miles	Type	Cost	Cu. Yds.
333	Earth grading	$1,000,000	5,000,000
66	Regrading	200,000	1,000,000
560	Gravel surfacing	850,000	800,000
75	Oil surfacing	300,000	115,000 tons
8	Paving high type	300,000	.....
15	Paving low type	200,000	.....
	Bridges	400,000	.....

There are also about 500,000 cu. yd. of grading work carried over from 1934.

H. C. Frahm, Bismarck, N. Dak., is Chief Engineer, State Highway Department.

South Dakota

State highway work in 1934 involved an expenditure of $9,627,000 and included 545 miles grading, 842 miles gravel road, 125 miles oil and 41 miles concrete. The 1935 program as outlined at present calls for an expenditure of $6,750,000 for 400 miles grading, 420 miles gravel, 50 miles oil and 30 miles concrete.

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Iowa

During 1934 the construction expenditures amounted to $12,477,605; mileage completed is as follows:

	Miles
Pavement	148
Bituminous treated gravel	196
Untreated gravel	192
Graded	377

The total construction expenditures for 1935 are somewhat uncertain at this time, what with the Federal Congress considering additional Federal appropriations for highway work, and the state legislature convening, with some thought being given to increasing the funds available for highway work. From sources of income now provided for, it would appear that the 1935 highway construction expenditures would not exceed $10,000,000. It is not possible to make accurate forecasts at this time of the mileage of the various types of construction as it will be completed during 1935. The best estimate at this time is the Department will build about 150 miles of concrete pavement and do a like amount of bituminous treated gravel work. It will probably build about 300 miles of road to an established grade and will probably gravel surface about 200 miles. There will doubtless also be the usual amount of bridge and culvert work incident to such a program. In 1934 the expenditures for bridge and culvert work amounted to approximately 20 per cent of the total expenditures.

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South Atlantic States

Delaware

State highways completed in 1934 included the following:

	Miles
Concrete 14 ft. to 22 ft	7.26
Bituminous Concrete Surface on Concrete base	3.32
Bituminous Macadam	1.78
Traffic Bound	71.49
Sand Clay	5.70

In addition 4 miles of concrete road and 26 miles of traffic bound were carried over to 1935. It is not possible at this time to give any details of the 1935 construction program. However, it is believed it will be approximately the same as in 1934. The accompanying table shows the hard surface roads of the state highway system constructed or acquired by years.

W. W. Mack, Dover, Del., is Chief Engineer, State Highway Department.

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Virginia

Expenditures for road construction in 1934 amounted to approximately $11,000,000. The mileage completed, 483; incompleted mileage, 418. Maintenance expenditures were approximately $5,500,000. The 1935 program is not available at this time. Secondary system expenditure, $5,500,000.

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North Carolina

New construction completed in 1934 amounted to 740 miles of highway at a cost of $7,783,000. Probable mile-

age for 1935 is 600, and estimated expenditures are $6,500,000.

W. Vance Baise, Raleigh, N. C., is Acting State Highway Engineer.

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South Carolina

The following is a summary of construction and maintenance activities of the state highway department for the fiscal year July 1, 1933, to June 30, 1934:

Construction expenditures	$3,556,593.98
Maintenance expenditures	1,110,008 84

Construction work completed during the year:

	Miles
Bituminous surfacing	338.15
Standard pavement	15.27
Earth type roads	14.29
Number of bridges	36

Status of the state highway system as of June 30, 1934:

	Miles
Completed—	
Standard pavement	2,396.1
Bituminous surfacing	1,214.99
Improved earth types	1,295.49
Total	4,906.58
Under Construction—	
Standard pavement	2.6
Bituminous surfacing	340.46
Improved earth types	5.1
Total	348.16
Unimproved	744.48
Grand total	5,999.22

The construction program for 1935 will be limited almost entirely to work financed in whole or in part by Federal funds provided by the Hayden-Cartwright Road Act of 1934; and the construction program thus provided is a part of a three year program, the funds for which are approximately as follows:

For year ending June 30, 1935	$2,770,000
For year ending June 30, 1936	3,400,000
For year ending June 30, 1937	3,400,000
Total	$9,570,000

Charles H. Moorefield, Columbia, S. C., is State Highway Engineer.

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West Virginia

State highway constructed in 1934 amounted to 552 miles, the expenditure being approximately $5,023,000. The expenditures for 1935 are indefinite at this time, but probably will be $6,500,000.

Mortimer W. Smith, Charleston, W. Va., is Chief Engineer, State Road Commission.

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Florida

It is not possible at this time to give detailed information as to the State Road Department's program for 1935. It is believed that the department will have an income of somewhere in the neighborhood of $10,000,000 which is to be used in the maintenance, betterment and construction of highways in this state and also to catch up with accounts that the department now owes. Of this amount there will be approximately $4,000,000 used in betterment and maintenance of roads; approximately $1,000,000 to catch up with the old accounts; approximately $2,500,000 of Federal monies, of which some has already been let to contract, and the balance to be used to maintain convicts and construct a few miscellaneous stretches of road that might be decided upon at the budget meeting in January.

J. H. Dowling, Tallahassee, Fla., is State Highway Engineer.

West South Central States

Texas

The first National Recovery projects under the Texas allotment of $24,244,024, were let in August, 1933, and between that time and Aug. 31, 1934, 1,801 miles were let at contract price amounting to $24,153,975. There were also a number of state projects let, and a summary of all construction contracts for this fiscal year is as follows:

	Miles	
Grading and small drainage structures	1,209.63	$10,717,464
Gravel, caliche, shell, etc., surface	141.46	765,184
Asphalt surface	888.56	8,610,907
Concrete and brick	231.30	6,433,593
Major structures	.....	4,407,637
	1,470.85	$30,934,786

During the fiscal year ending Aug. 31, 1934, the following miles of construction were completed with the cost as shown:

	Miles	
Grading and small drainage structures	850.80	$ 7,179,925
Gravel, caliche, shell, etc., surface	151.60	821,873
Asphalt surface	709.15	4,414,175
Concrete and brick	198.91	4,844,899
Major structures	.....	1,319,390
	1,190.47	$18,580,263

In addition to the contracts completed, there were on Aug. 31, 1934, 1,589 miles still under contract as follows:

	Miles	
Grading and small drainage structures	784.29	$ 8,692,291
Gravel, caliche, shell, etc., surface	60.42	441,766
Asphalt surface	586.99	5,888,373
Concrete and brick	156.87	4,199,985
Major structures	.....	3,948,288
	1,588.57	$23,170,705

In addition to the 1,589 miles shown above as active, there were also 774.5 miles of grading and small drainage structures, gravel, caliche, etc., surfacing being constructed as storm and drought relief projects. These projects are being handled on the basis of 30 per cent of the cost being furnished by the Public Works Administration through the Bureau of Public Roads and the highway department, and the remainder, consisting of labor, being furnished by the Relief Commission.

Texas' allotment under House Bill 393 of the 73rd Congress, known as the Hayden-Cartwright Act, amounts to $12,291,253. Contracts let on Nov. 8th and Nov. 26th, 1934, under this allotment amounted to $2,247,820.95, and the balance will be placed under contract as rapidly as plans are approved by the Bureau of Public Roads. As the states revert to the former allotments of Federal Aid, beginning with the Federal fiscal year 1935-36, Texas Federal Aid will amount to approximately $7,500,000 per year, which must be matched dollar for dollar with State funds. With State Highway Department revenues from the gasoline tax and license fees remaining constant at $18,000,000, and with $10,000,000 necessary for general maintenance and betterment work on the 19,922 miles of state highways maintained, the balance is barely enough to match Federal Aid.

In line with plans being formulated for a Texas Centennial Exposition in 1936 to celebrate the 100th anniversary of Texas freedom, to which celebration the entire nation is cordially invited, the Highway Department is concentrating its efforts on the closing of gaps in the main highways during 1935-36.

Gibb Gilchrist, Austin, Tex., is State Highway Engineer.

What About 1935?

FOR 20 years ROADS AND STREETS has published in its January issue information on what state highway departments had done during the year just past and what they intended to do in the coming 12 months. This year, for the first time, it has been somewhat difficult to get any definite facts or figures from several states either on the work completed or on their future constructive programs.

As a matter of fact in many states the appropriations for new construction in 1935 have not yet been decided on. The legislatures of 44 states are now in session and they will decide on the amounts to be spent. *American Highways,* the official organ of the American Association of State Highway Officials, estimates that the cash payments in 1935 for road construction only, through state highway departments, will amount to $528,932,139. Of this total $240,000,000 will be from state funds, and $288,932,139 will be from Federal funds. The figure for state funds is an estimate. It certainly will not be lower and there is good reason to believe it may be higher, as the legislatures of a number of states are considering increasing the allotments to road funds. In any case the appropriations for maintenance will not be decreased.

The old policy of Federal highway aid will be resumed this year and $125,000,000 from this source becomes available on July 1. The states, of course, have to match this sum dollar for dollar. The act authorizing the resumption of Federal Aid contained the excellent provision that any state making any further diversion of gasoline taxes and motor vehicle license fees should lose one-third of the Federal Aid to which it was entitled.

President Roosevelt's new many billion dollar public works program includes a considerable amount of highway construction and grade crossing elimination work. It is likely that $250,000,000 to $500,000,000 will be made available for the last mentioned improvement alone. The average cost of the 482 grade crossing elimination projects under the present public works program, approved up to September 30 by the Bureau of Public Roads is $46,000. So it will be seen that if even only $250,000,000 is supplied for this work under the new public works program, there will be 5,000 to 6,000 separate jobs. It is not conceivable that all this work will be done by hand labor. In fact, in the latter part of last year the fallacy of substituting hand labor for operations that for many years had been done by machinery became so apparent that equipment was put back on many jobs.

Certain provisions of the National Recovery Act under which highway contracts were carried out caused considerable hardship to contractors. One of these related to the 30-hour week for common labor. This placed an unnecessary burden on the contractor due to loss of time and to the continuous shifting of forces. It also failed to provide an adequate compensation for the common laborer. The provision for the classification of labor on highway contract projects under the act provided that skilled and intermediate classes of labor must come from the county within which the project was located. This, too, in many instances placed a burden on the contractor. It is pleasing to note that the American Association of State Highway Officials, recognizing these unnecessary conditions, passed resolutions at their Santa Fe, N. Mex., meeting recommending that a maximum of 40 hours per week be allowed on any contract for highway work. The association also recommended that contractors be allowed to secure their skilled and intermediate labor from any place within the state. Another resolution passed by the association of particular interest to contractors related to the Aggregate Industry Code. The association recommended that contractors when producing materials for a particular job from a plant which is not used for commercial purposes should not come within the purview of Code No. 109 of the Crushed Stone, Sand or Gravel and Slag Industries, but should come under the regulations of the Secretary of Agriculture through the United States Bureau of Public Roads.

$125,000,000 Apportioned For Federal Highway Aid

Apportionment of $125,000,000 for Federal aid to the states in highway construction in the fiscal year beginning July 1, 1935, marked the resumption of the old policy of Federal highway aid. The apportionment was made by Henry A. Wallace, Secretary of Agriculture, on December 27 under the authorization contained in the Hayden-Cartwright Act of June 18, 1934.

Secretary Wallace, in making the apportionment, called attention to the possibility of reduction of a state's apportionment through the operation of the provision in the Hayden-Cartwright Act relative to the diversion of gasoline taxes and other taxes on motorists. The act provides that Federal aid for a state's highways shall be reduced unless the state uses for highways at least the amounts provided by law on June 18, 1934, for that purpose from the state's gasoline and motor vehicle taxes and other special taxes on motor vehicle owners.

The apportionment is as follows:

State	Sum Apportioned	State	Sum Apportioned
Alabama	$2,604,320	Nebraska	$2,581,663
Arizona	1,781,347	Nevada	1,595,501
Arkansas	2,142,723	New Hampshire	609,375
California	4,756,959	New Jersey	1,675,751
Colorado	2,288,811	New Mexico	1,999,299
Connecticut	791,253	New York	6,150,106
Delaware	609,375	North Carolina	2,938,657
Florida	1,655,723	North Dakota	1,960,162
Georgia	3,168,221	Ohio	4,565,435
Hawaii	609,375	Oklahoma	2,947,521
Idaho	1,531,162	Oregon	2,044,633
Illinois	5,160,696	Pennsylvania	5,348,062
Indiana	3,087,613	Rhode Island	609,375
Iowa	3,231,718	South Carolina	1,692,896
Kansas	3,317,054	South Dakota	2,036,775
Kentucky	2,304,143	Tennessee	2,638,159
Louisiana	1,776,939	Texas	7,777,504
Maine	1,090,167	Utah	1,410,752
Maryland	1,025,870	Vermont	609,375
Massachusetts	1,741,877	Virginia	2,278,475
Michigan	3,837,292	Washington	1,949,957
Minnesota	3,423,306	West Virginia	1,356,793
Mississippi	2,196,524	Wisconsin	3,045,557
Missouri	3,800,856	Wyoming	1,559,444
Montana	2,560,449		

EQUIPMENT REVIEW SECTION

Developments in Equipment and Materials During 1934

Graders and Maintainers

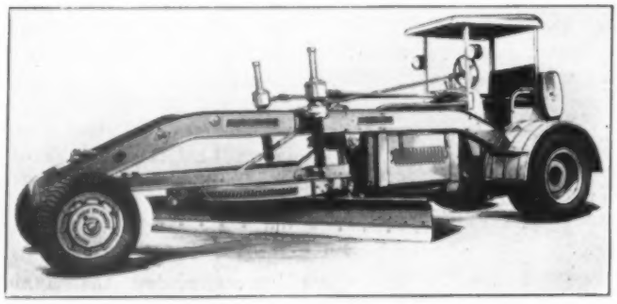
New A-C Speed Patrol Grader

The illustration shows the Model "54" speed patrol grader of the Allis-Chalmers Manufacturing Co., Milwaukee, Wis. This model is considerably heavier than the Model "42" patrol as it weighs 14,455 lb., and has twelve additional horse power. It is longer than the Model "42" and the frame is considerably heavier.

Power units in A-C speed patrols are standard Allis-Chalmers tractor engines. All the "more value" features of Allis-Chalmers engines are incorporated . . . removable cylinder sleeves . . . inserted valve seats . . . and many others. Parts and service are readily available in every locality. The Model 42 develops 42 engine horsepower. The Model 54, 54 engine horsepower.

Power control is of the mechanical type. Power is taken off the front end of the tractor so that it is continuously available, regardless of the movement of the machine. All blade and scarifier adjustments are made by power control. A small gear box conveniently located carries five control levers, two for the blade lift, one for circle turn, one for circle side shift and one for scarifier. A clutch is provided to disconnect the power control drive instantly from the power shaft. A large cushion seat is provided as standard equipment on power controlled machines. Controls, steering wheel and seat are properly placed so that the operator may stand or sit as desired.

Hand control is furnished on either model, in place of power control, if desired. Hand controlled speed patrols are identical in general construction with power controlled models. They are equipped with auxiliary blade lift springs and easily operated hand wheels. All adjustments are made from the operator's platform.



Model 54 A-C Speed Patrol Grader.

Specifications for the Model 54 include the following:

Over-all dimensions: Length, 22 ft., 8 in; width, 88 in.; height (with cab), 8 ft., 9 in.; height (without cab), 6 ft., 7 in.

Wheelbase, 18 ft., 6 in.

Maximum blade pressure: Without scarifier, 8925 lb.; with scarifier, 10,275 lb.

Speed: Low, 2.3 M.P.H.; second, 3.5 M.P.H.; third, 5.2 M.P.H.; fourth, 10.0 M.P.H.; reverse, 2.8 M.P.H.

Frame: Shape, structural channel; size, 10 in.; weight, 30 lb. per ft.; cross member: 3 tubular members, front 6 in., center 8 in., rear 6 in.; 1, 10 in. tie channel, 2 rigid head castings.

Moldboard: Length, standard, 12 ft.; width, standard, 18 in.; thickness, standard, ¾ in.; radius, standard, 11 in.; reinforced angle, 3 in. x 5 in. x ½ in.; moldboard arms, 5 in. x 1 in. braced together; pitch adjustment, forward from vertical to any required position; mounting, ball and socket with wear take-up; side shift of circle and moldboard, 24 in., on 2¼-in. dia. screw, supported from main frame; lift above ground, 15 in.

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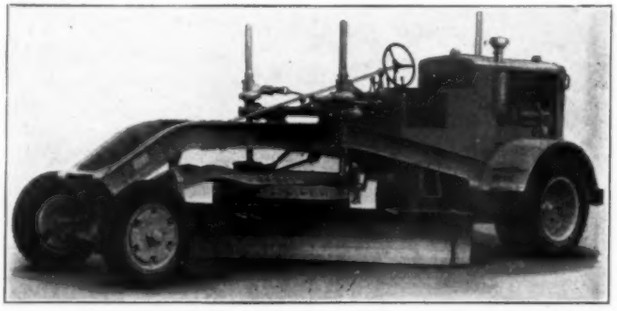
The "Caterpillar" Diesel Auto Patrol

A "Caterpillar" diesel auto patrol bringing together the proved economy of the Diesel engine and the proved efficiency of a leading road maintenance machine, was brought out by the Caterpillar Tractor Co. of Peoria, Ill. Neither unit is new, as the 3-cylinder, 4-cycle Diesel engine has seen service in hundreds of Diesel Thirty-Five tractors and power units, and the auto patrol has been popular for road maintenance and oil-mix work since it was first introduced nearly three years ago.

Among the features claimed for the Diesel auto patrol are outstanding fuel economy, increased power, greater capacity, heavier frame, additional weight, and greater lugging ability.



Also Available in Tandem Drive With Single or Dual Wheels.

The engine develops 47 maximum brake horsepower at governed speed of 850 r.p.m., and the machine has a shipping weight of 15,150 lbs. Such well-known features as full power control of all blade adjustments, rear mounted engine, positive drive to dual rear wheels, elimination of the differential, four forward speeds ranging from 1.8 to 10 miles per hour, heavy structural steel circle and extra wide 12-ft. blade equipped with end bits, are stated to adapt the machine to all kinds of maintenance work, including regrading and snow plowing, as well as many surfacing jobs including sub-grading and oil-mix work. Power operated scarifier and snow plow are available as special equipment.

"Caterpillar" Diesel Auto Patrol With Dual Drive Rear Wheels;

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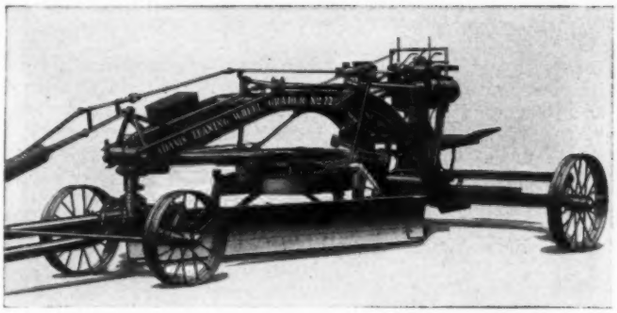
Power-Operated Controls for Adams Leaning Wheel Grader No. 22

The availability of power-operated controls on Adams leaning wheel grader No. 22 (10 ft. blade) is announced by J. D. Adams Co., of Indianapolis, Ind.

The power control mechanism is the same type as has been used successfully on Adams 12 ft. blade machines for several years. Power is supplied by a single-cylinder, 5½ H.P., air-cooled Wisconsin motor mounted forward of the operator's platform from where the power is transmitted by roller chain and sprockets to the power control box in front of the operator.

Through convenient levers all operating adjustments are made quickly and easily—these adjustments include leaning of the wheels, vertical and lateral adjustment of the blade, and operation of the steerable tongue. Claims stressed by the manufacturer are that these mechanical controls are very positive in



Adams Leaning Wheel Grader No. 22 with Power Operated Controls

action permitting very positive and accurate adjustments and that two or more adjustments can be made as quickly as one thus speeding up operations.

The machine weighs approximately 7,000 lb. and is intended for use with tractors of 40 to 50 drawbar H.P. Hand-operated controls are available if desired.

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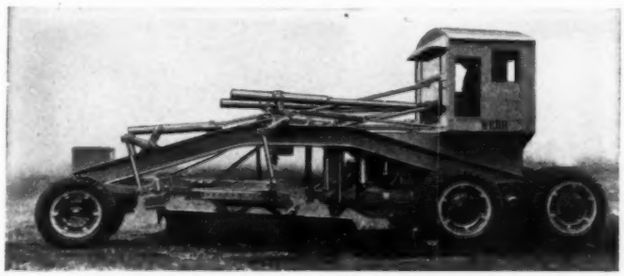
New Wehr Motor Grader

The new Quad 4 and 8-wheel drive motor grader of the Wehr Co., Cudahy, Wis., are each made in three sizes with a wide choice of tire sizes. The Quad "8" has eight individual drive wheels—not 4 wheels with extensions. Although it has 8 drive wheels the overall width is stated to be less than a single drive grader with dual rear tires.

The Quad drive unit has unrestricted oscillation at the pivot point. Regardless of the unevenness of the road surface, all of the wheels are stated to have full contact with the ground, assuring maximum traction under all conditions. It can be equipped with either 2 or 4 wheel genuine Lockheed hydraulic brakes.



Wehr Quad Motor Grader

An outstanding improvement in control design, is the Wehr "finger-tip" position of the power control handles, which respond instantly to a natural action of the hand, directing the same motion to the circle, blade, scarifier and blade side shift. Natural-movement control handles are entirely in the clear, insuring freedom of steering and operation.

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Junior Workman Now Equipped with Pneumatic Tires

In order to meet the demand for faster operating speed and quicker moves from one job to another The Cork Junior Workman, a product of the Cork Modern Corporation, Unadilla, N. Y., can now be obtained with pneumatic tires as optional equipment. The tires are heavy duty, six ply, size 16x6.50, with extra heavy tubes. The Junior Workman combines a rake with a blade unit. The rake teeth are made of special analysis steel, selected for strength, flexibility and wearing ability. They are so spaced that fine material and small stones sift through, thus spreading the good road material, while larger stones are carried to the side of the road. The blade unit consists of three concave blades—one long and two short—bolted to a heavy electrically welded frame. A guide anchored to the main frame holds the blades in position.

New Tractor Powered Road Shaper

A new road scraper powered by a tractor was brought out by the Fate-Root-Heath Co., Plymouth, O. The design of the shaper enables the operator to set the blades on the machine in connection with the sliding shoe, cutting only the high points and filling that material into the low places. One of the claims made for the machine is that it will not cut nor stir up any material which lies below the level of the road. The shaper has two blades set at opposite angles, thus providing a shearing action from two directions which removes corrugations and irregularities. The material moves slowly along the front blade to a gate, then back along the rear blade, being pulverized and mixed in the process. As the shaper passes over ruts and depressions they are filled by the surplus material. When blades are property adjusted about ⅓ cu. yd. of material is carried in front of the blades at all times. The only escape for the material is underneath the cutting edges. This prevents the formation of drifts or ridges when the road is worked. The blades have double edges and two sets of holes, making them reversible and giving double wear. The blades are also interchangeable. The effective working width of the shaper is 7 ft. By the use of a special apron attachment, the deposit of earth may be narrowed as desired in forming berms and similar work.

The shaper is raised by hand hydraulic lift, and automatically lowered when in neutral position. Blades can be quickly and easily raised and lowered while the machine is in motion.

The straight-edges are 15 ft. in length, rigid and sturdy, and each is provided with wearing shoes ½ in. thick, turned up at each end, and can easily be replaced at low cost when necessary. The cutting edges are attached rigidly to the left-hand straight edge but hinged at the center of the right-hand straight edge. This permits the right-hand straight edge to ride the uneven surface over which it travels, while forming a bridge to support the blades. Screw adjustments are provided to compensate the wear and keen blades cutting at the desired depth.

The shaper is powered by a Silver King tractor manufactured by The Fate-Root-Heath Co., Plymouth, O. The shaper application is easily detached from the tractor, thus making the latter available for other work. The four-speed transmission provides variable speeds. The high gear is for transportation or traveling from and to the job, or from one job to another.

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The York Maintainer

A maintainer having three separate units—a scarifier, blades and a rake, is a product of the York Modern Corporation, Unadilla, N. Y. In operation the scarifier opens the way for the blades—breaking up the hard-packed surface. The blades follow, paring off the desired depth, thoroughly mixing and pulverizing the material before it is discharged into the rake. The rake extends far enough beyond the heel of the blade to pick up all the windrow. This device spreads the loose material—sorts out the larger stones and leaves a smooth surface behind.

Important features of this maintainer include the following:

Steering device consisting of machined, heat-treated gears operating in oil-filled, dust-proof case.

Heavy front-end assembly; steering rack and bolster cast in one piece; ball and socket frame connection.

Heavy forged steel scarifier draw arms, formed to give direct draft from front of frame.

One-piece cast steel scarifier head, especially adapted to withstand shock. Adjustable to three positions. Scarifier teeth of special alloy, heat-treated steel. Teeth are adjustable for longer wear.

Reversible moldboard-shaped blades, all edges beveled. Heavy, electrically-welded steel frame to support blades, steadied by a guide which is anchored to the main frame. Blade unit is drawn by a gooseneck made from forged steel, electrically welded.

Shock springs on all pressure rods.

Front section of rake with 40 special-treated spring-steel teeth, mounted on a spring-steel frame. Rear section of rake with 32 closely-spaced teeth. This section can be extended about two feet to the right.

Blade unit adjustment by which the cutting depth of the short blade may be adjusted.

Rake lifting levers, properly placed to give the operator complete control of the rake with minimum effort.

Frame constructed from heavy structural steel angles, rigidly braced, and electrically welded into a unit structure.

Steel lattice-work, electrically welded operator's platform, suspended on coil springs to protect the operator from road shock.

Scarifier handwheels. Dual controls for the scarifier are a feature of the machine. Conveniently located steering wheel.

Machine-cut, heat-treated steel gears enclosed in dust-proof cases, operating in oil. Pressure lubrication on all bearings and moving parts by means of Alemite fittings.

Draft of scarifier and hone from front of frame. Hone drawhead acts as a pivot for scarifier sway-bar.

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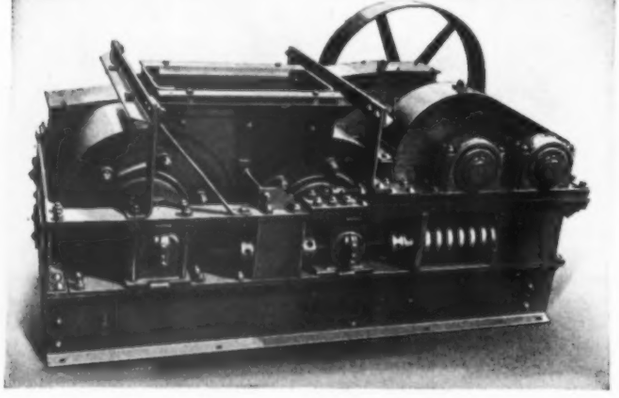
Crushers and Gravel Plants

New Austin-Western Roll Crusher

A new reduction roll crusher, built primarily to produce material from 1½ in. down to dust (though it will handle larger sizes) has been announced by the Austin-Western Road Machinery Co. of Aurora, Ill. According to the manufacturers, it requires less power and since it operates faster (60 R.P.M.) its capacity is therefore greater.

The rolls measure 18 in. wide by 30 in. in diameter and are equipped with 2-in. thick, removable, manganese shells. Each roll is supported by two, large SKF, self-aligning, roller bearings, that rotate on heavy stationary shafts. These bearings are located inside the rolls, close to the outer shaft supports to materially reduce shaft load.

All crusher shafts, when operating under load are subject to a certain amount of deflection which if not corrected will cause premature and excess wear or heating; such conditions



New Reduction Roll Crusher

cannot develop in this crusher because the bearings can never get out of alignment.

Two massive screws (heavy-spring equipped) permit any desired adjustment of rolls and act as safety releases against tramp iron or other unscrushable material.

Belt driven pulley shaft is geared to sprocket countershaft using heavy roller chain to operate the rolls. The chain drive permits a greater variation in the spread of the rolls, hence a greater variation of finished sizes.

Gearing, sprockets and chain are fully enclosed with heavy metal guards—Alemite lubrication is used throughout.

▼

New Crusher Plants

The illustration shows a crushing plant furnished the U. S. Forest Service by the Iowa Manufacturing Co., Cedar Rapids, Ia., for work in their different camps this summer. This unit is very compact with the power unit mounted right on the same truck chasis. The elevator is folding type and breaks down when moving. The entire plant is built to Government specifications.

Several types of tractor-crusher plants also were brought out. In one of these the low feeding height of the crusher permits hand loading. The plant is driven down the road like an automobile by the driver sitting in the tractor seat. The power is taken off the power takeoff of the tractor drive through the countershaft to the clutch shown in the photo and then by "V" belt drive to the crusher flywheel. The clutch is operated by a lever conveniently located at the operator's seat. A highly desirable maintainance unit for all branches of government agencies.

Another type of tractor-crusher unit is equipped with a front end scoop like a concrete mixer. The bottom plate in the scoop is perforated to screen out the sized material before dumping into the mouth of the crusher. The raising and lowering mechanism is controlled by levers located at the operator's

Crushing Plant with Power Unit on Truck Chassis

seat. The crushed material is conveyed by a small cross conveyor under the crusher to a side delivery conveyor where it can be either dropped on the ground or into trucks. A separate power unit is mounted on the rear of the truck for driving the crusher separately.

Another type is known as the trailer unit. A small crusher is mounted on the two-wheeled steel roller-bearing truck and the power is furnished from a power takeoff on the rear of the tractor, through a universal drive shaft as shown in the photo. The universal drive shaft drives a grooved sheave which drives the "V" belts to the crusher flywheel.

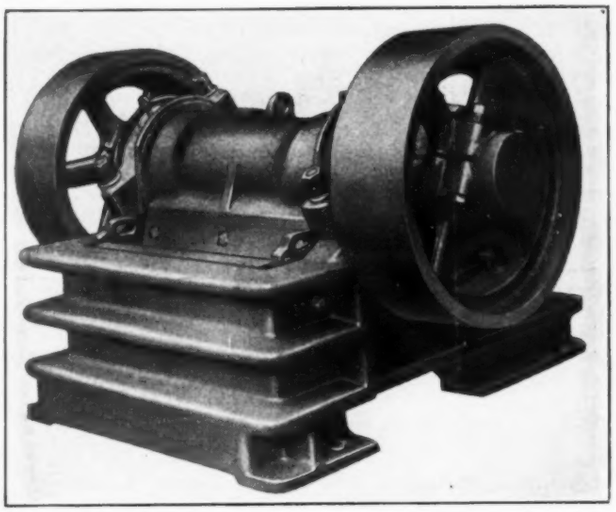
▼

New Crusher

A new single shaft roller bearing jaw crusher was brought out by the New England Road Machinery Co., 163 C St., South Boston, Mass. The frame is made of annealed cast steel and is reinforced by heavy horizontal and vertical ribs. The swing jaw also is made of annealed cast steel, with heavy vertical and cross ribs and with large housing to receive heavy duty cylindrical roller bearings, and a replaceable toggle seat.

The eccentric shaft is made of hammered chromium nickel steel accurately finished, ground and polished. This shaft operates in roller bearings of the advanced type, and the entire shaft unit is readily removable merely by taking off the main bearing caps.

The bearings are of the cylindrical heavy duty roller type and



New England Single Shaft Roller Bearing Jaw Crusher

are used in both swing jaw and frame. The rollers are heat treated alloy steel, running in races of similar material. The rollers are held in place by bronze retainer rings and are protected by piston ring seals which prevent entry of dirt and loss of lubricant.

In the crushing action, the upper part of the swing jaw moves outward to crush the coarse rock—then recedes as the upper stroke terminates. The lower part of the jaw moves forward to finish the crushing action, then recedes to begin a new cycle. The crushing stroke, having the greater movement at the top and diminishing at the bottom is a very effective action particularly in producing more uniform sizes—¾ in.—1 in.—1½ in. stone.

The stationary and swing jaw dies are made of manganese steel, with the backs and edges ground to assure an accurate fit, and are reversible.

The length of the lower crushing stroke can be altered by changing the position of the toggle in the seat notches. The lubrication of the crusher is through alemite fittings.

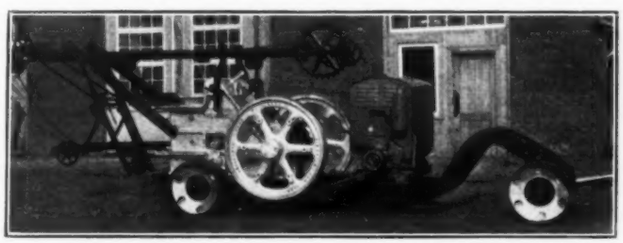
The crusher is made in five sizes: 9x22, 6x36, 10x36, 16x36 and 24x36.

▼

New Universal Portable Crushing Unit

A new portable crushing unit with crusher and power mounted on a single truck was brought out by the Universal Road Machinery Co., Kingston, N. Y. The crusher is operated through a V-belt drive, no belt tightener being required.

The outfit is designed particularly for road maintenance, where a crusher is to be hauled along the road continuously, using fieldstone or old stone walls for crushing, and simply leaving the



Traveling Crusher with Elevator Lowered for Transportation

stone in small piles or windrows alongside the road for use. It is built very low to the ground so that it is easy to feed, and is mounted on heavy substantial disc wheels with a wide tire, and fitted with Timken roller bearings so that it is exceptionally easy to haul. The crushers can be furnished with or without folding elevators as desired.

Machine for Eliminating Soft Stone from Aggregate

The constant tightening of specifications on concrete aggregate, especially for road and bridge work, has moved many material producers and the manufacturers of gravel plant equipment to seek new and better methods for eliminating soft stone from bank run material. One of the recent developments is a machine designed and built by the Knickerbocker Co., Jackson, Mich., which is claimed to eliminate ochre, sand stone, sailers, chalk, lignite, etc., at a minimum cost and with a minimum breakage of good stone.

The equipment, known as the Knickerbocker soft stone eliminator, consists of a rotor revolving in a vertical plane within a suitable casing. The rotor is supported by a heavy shaft revolving in two roller-bearing pillow blocks. The impact bars of the rotor are of high-alloy, especially heat treated steel. The rotor is carefully equilibrated for both static and dynamic balance when assembled, to accommodate the required speeds without vibration.

In operation, the eliminator is introduced into the line of production after the sand has been removed from the bank run material. The stone is fed into the machine through the 15-in. opening on the charging side, goes through the unit and is discharged at the bottom, generally onto a sizing screen. While inside the machine, the stones are struck repeated blows of constant intensity by the impact bars, are carried up around the inside of the casing and are subjected to constant abrasion upon each other before being discharged. An inlet provides for the introduction of water and the pulverized soft stone runs off at the bottom in the form of a thick sludge.

Users of this equipment claim that it not only brings the soft stone content of their product well within specification requirements, but that this result is achieved at remarkably low cost and with a minimum waste in the form of good stone broken up. A 20 hp. motor runs the outfit, which has a capacity of from 50 to 90 tons per hour.

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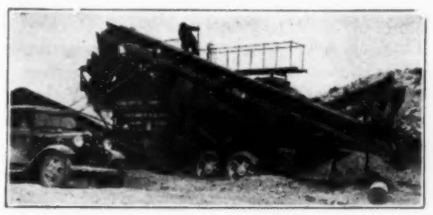
1935 Pioneer 15-35 Duplex Gravel Plant

Greater crushing, screening and conveying capacity is claimed to be the primary feature of the 1935 Model Pioneer 15-35 Duplex plant, a product of the Pioneer Gravel Equipment Mfg. Co., Minneapolis, Minn.

The Pioneer 15-35 Duplex has an 836 or 1036 primary jaw crusher with SKF bearings, overhead eccentric, forcefeed action, steel base and pitman, and reversible manganese jaws with positive adjustment. The secondary crusher is a 40-in. x 20-in.



1935 *Model Pioneer No.* 15 *Duplex Plant on a St. Louis County, Minn., Project.*

roll crusher with manganese shells, 40 in. in diameter and 20 in. wide, carried on heavy shafts, with Timken bearings fully enclosed in self-aligning dust-proof housings.

The Shaker screen has an effective screening area of 28⅔ lin. ft., requires less head room and produces pay material on both decks.

In this new plant a return conveyor now replaces the bucket elevator. The lower conveyor passes directly under both crushers which eliminates the cross conveyors. Crushed material is returned to the lower deck of the Shaker screen and not to the feeder conveyor.

The Pioneer 15-35 Duplex embodies the Pioneer Duplex circuit. This exclusive Pioneer feature is stated to require no scalping screen, to permit both decks to produce pay material, does not mix crusher material with pit run material and enables the operator to balance the work of both crushers instantly without shut down and without changing screens.

Rollers

New Galion Roller

A new 3-wheel roller in 5 and 6-ton sizes with 37 H.P. 6-cylinder engine was placed in production by the Galion Iron Works & Mfg. Co., Galion, O.

The rollers are regularly equipped with worm and sector steering gear but can be furnished by hydraulic steering device. An efficient hydraulic control scarifier can also be supplied. The engines are of ample power and are equipped with oil type air cleaner, variable speed governor and gas pump. Electric starter and electric lights can be furnished if desired.

Transmission is exceptionally sturdy. Oversize gears and shafts

The Galion Warrior

are fully enclosed and operate in an oil bath. Anti-friction bearings are used throughout. Axles are oversize and are made of special alloy steel. Extra large, long wearing trouble proof clutches are installed.

The roller has the following speeds: Low 1.69 M.P.H., Intermediate 3.44 M.P.H., High 5.90 M.P.H. Additional ranges of speeds down to .85 M.P.H. in low secured through use of the variable speed governor which is adjustable from operator's platform.

The wheelbase is 9 ft. 9 in. and the rolling width 5 ft. 10 in. with 18 in. rolls. The overall length, without scarifier, is 15 ft. 7 in.; with scarifier 16 ft. 9 in. The height overall is 75¾ in. and the ground clearance 13⅛ in. The turning radius is 14 ft. 9 in.

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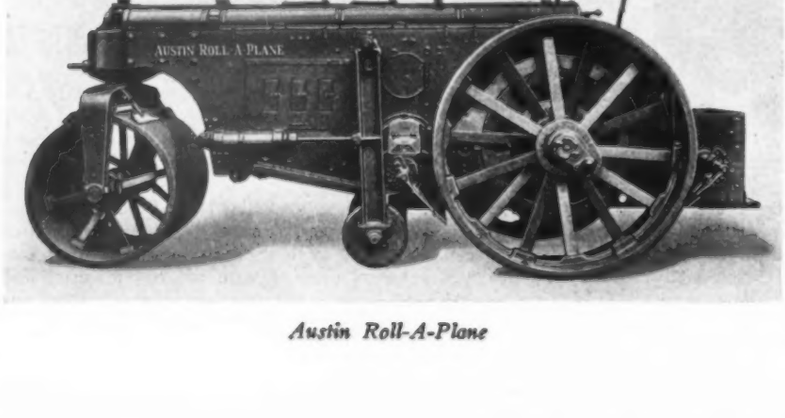
Austin Roll-A-Plane With Added Center Roll

A new three-wheeled roller operating on an entirely new principle for securing unequalled levelness and smoothness of pavement surfaces has been announced by The Austin-Western Road Machinery Co. of Chicago. According to this company, the Roll-A-Plane reduces the cost of surface finishing and subgrade preparation and imparts a level smoothness that lengthens the life of the road and lowers the cost of subsequent maintenance.

On asphalt or "black top," the Roll-A-Plane does an exceptionally fine job because the third or center roll is capable of concentrating 85% of the total roller weight on the high spots. This amounts to a maximum pressure of 20,375 pounds (with 10-ton model) or a lineal inch compression of 450 pounds and up, depending upon the amount of surface in contact with center roll. If high spot is but a few inches in size, the roller pressure is tremendous. This high compaction so obtainable, is capable of flattening out stubborn "wavy" areas and forcing the excess material into the adjacent low spots.

The center roller is hydraulically operated from the dash and can be raised and lowered to any position or set to form a perfect plane with the front and rear rolls. When large waves or irregularities are encountered, center roll may be raised slightly to better assist in the smoothing-down process, after which roll is lowered (in line with other rolls) to complete the operation.

The Roll-A-Plane automatically indicates high and low areas permitting immediate correction, while asphalt is still hot, thereby securing a more intimate bond with uniform road smoothness and color. Center roll can be removed whenever it is found desirable to do so. Full details are described in a newly issued bulletin.



Austin Roll-A-Plane

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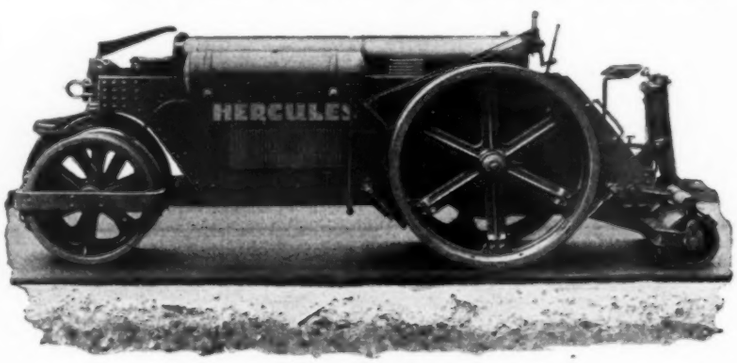
Hercules Ironer Roll Attachment for Rollers

The Hercules Company of Marion, O., announced their Hercules Ironer Roll, an attachment for their Hercules 3-wheel rollers. This ironer roll is an auxiliary roll of small diameter, mounted in place of and interchangeable with the scarifier. It is hydraulically operated, roller bearing mounted and has great flexibility in its operation, having a range from minus 6 in. to 6½ in. above grade, and hydraulic pressure range from zero to 300 lb.

In operation, it is stated, a weight corresponding to more than 50 per cent of the total weight of the entire roller may be exerted on this auxiliary roll, and as the small diameter of the roll provides a shorter arc of contact with the material being rolled, better compaction is obtained, high spots are eliminated and uniformly level surface obtained.



Hercules Ironer Roll Attached to Roller

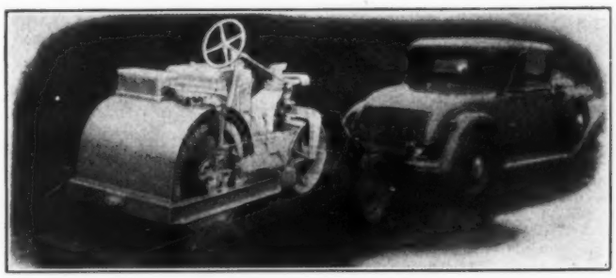
An important factor in the operation of this Hercules Ironer roll is the positive-power-control which automatically maintains proper traction on the rear driving wheels at all times.

It is claimed that placing this auxiliary roll at the rear of the Hercules three-wheel roller, a perfect plane is obtained about 17 ft. in length. This long plane surface successfully eliminates short waves in the road surface which ordinary rollers, whether tandem or three wheel, do not eradicate.

It is stated that a smooth level surface, free from wheel marks, is obtained with a few longitudinal passes of the Hercules roller equipped with this ironer roll. Less rolling time is required to complete the job and the necessity for cross rolling is eliminated. This last feature is particularly desirable where it is necessary to maintain traffic during construction as a single traffic lane may be repaved with this equipment without obstructing the second lane.

Light Weight Rollers

Three new light weight rollers were announced by the Pierce Governor Co., Anderson, Ind. They are designed for lighter work and for use on jobs where heavy rollers are impractical and where the use of hand rollers is slow and expensive. One of these is a small ¾-ton power driven motor for work on lawns, golf greens, private estates, etc. Another is a 1½ to 2-ton size intended primarily for use on school grounds, airports, cemeteries, etc. The third roller is a sturdy, compact 3-ton roller designed for small construction jobs, patching asphalt, rolling driveways, leveling ditches, rolling highway shoulders and burms, and a majority applications of numerous asphaltic materials. It is claimed to be especially adapted for rolling between concrete forms or car tracks. Provisions are made for watering both rollers when used for asphalt surfacing. Heavy steel housing encloses and protects all moving parts. Adjustable scrapers on front and rear rollers. This roller has a 4-cylinder Continental Red Seal Motor, 12 to 18 HP. Its rear roll compression is 140 lb. per lineal inch.



Bear Roller Being Transported to Job on Pierce Trailer.

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New Hydraulically Controlled Motor Roller

The Huber Manufacturing Co., Marion, O., announced a new and improved six cylinder, three speed, hydraulically controlled road roller, which offers many new features.

Power is furnished by an industrial type six cylinder engine developing 59 h.p. at 1200 r.p.m.

Of unusual interest is the new dual steering control which provides a quick, effortless hydraulic power steer that can be changed instantly to the dependable hand steer so desirable in working in tight quarters where the hand steer acts as a vernier to the power steer.

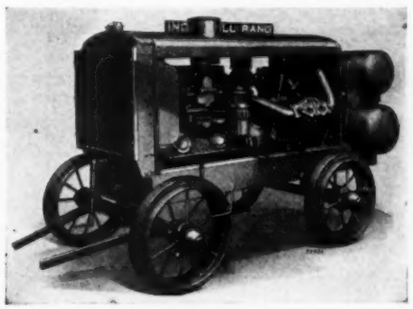
Other Huber road roller features including (1) a dry removable cylinder sleeve application through which water cannot leak into the crank case, making cylinder bore replacement exact, easy and economical; (2) precision engine bearings make is unnecessary to remove engine from chassis to replace bearings which fit crank shaft exactly without scraping or otherwise fitting; (3) self-adjusting forward and reverse clutches; (4) low pressure hydraulic system; (5) full jeweled with roller bearings . . . twenty-five roller and ball bearings carry every journal including front and rear axles and king pin; (6) differential lock from operator's platform; (7) through going rear axle with direct drive on each roll; (8) low pivot front roll arch makes rolling a straight line over rough ground an easy matter; (9) short turning due to front arch construction; (10) solid hub, web type rolls with spoke web near edge to prevent cracking or breaking of rim; (11) low center of gravity . . . more than three quarters of engine and transmission weight below center of rear axle; (12) narrow rolling width . . . with 20-in. rear rolls, the Huber is only 6 ft. wide; (13) three speeds in both directions ranging from approximately ¾ to 6 m.p.h. through governor control and (14) instantaneous forward or reverse without shifting gears.

Compressors

New Model 85 I-R Portable Compressor

A new two-stage, air-cooled portable compressor has been added to Ingersoll-Rand's line of "portables." It is known as the "Model 85," is driven by a Waukesha gasoline engine, and has a capacity of 85 cfm. at 100 lb.

The new Model 85 compressor has two low-pressure and one high-pressure air-cooled cylinders and an air-cooled intercooler. It is claimed by the manufacturer that the air cooling, two-stage compression, intercooling, and certain manufacturing refinements all combine to make a saving of up to 25 per cent over the fuel cost of water-cooled, single-stage portable compressors; furthermore, that two-staging gives increased efficiency at high altitudes and in hot climates over single-stage units. Cylinders and valve temperatures are said to be 200° lower than in single-stage units, resulting in tighter valves and longer-maintained high efficiency.



New Model 85 I-R Portable Compressor.

Other sizes in which the I-R two-stage, air-cooled portable compressor is made are: Models No. 60, 160, 210, 105 and 315. These sizes are available either gasoline-engine-driven or oil-engine-driven.

▼

Two Stage Compressors Added to Schramm Line

Schramm, Inc., of West Chester, Pa., have announced the addition of a complete line of two stage portable compressors to their line of single stage machines.

The one outstanding characteristic of the two stage outfit is the fact that many parts are interchangeable with the single stage compressor permitting the user to utilize many of the parts which he may already have on hand for servicing the new design.

The greatest efficiency has been secured by piping air from the first stage through a cross-flow type intercooler into the second stage which gives the air the final compression before entering the air receiver. The Schramm two stage compressor is stated to eliminate many unnecessary packings, pipings and fittings and result in a compact, straightline design, all moving parts being in perfect mechanical balance and easily accessible for servicing.

Schramm Two Stage Compressor.

The vertical, water cooled design is again used in the Schramm two stage compressor.

These new, two stage Schramm compressors are built in four popular sizes (Models 105, 160, 210 and 315) with either gasoline or Diesel engine drive, and are available in all types of portable mountings, including wooden skid mounting, steel

wheels, rubber tired wheels, Schramm spring trailer, two wheel trailer, motor truck mounting, rail car mounting, etc.

A new bulletin 3501 (BS) describing the new two stage compressor as well as the complete line can be secured by writing to Schramm, Inc., West Chester, Pa.

▼

New Line C P Portable Compressors

A new line of two-stage, air-cooled portable compressors has been brought out by the Chicago Pneumatic Tool Co., 6 East 44th St., New York.

Among the important features claimed for this new line are the following:

No more parts than single-stage type; only one connecting rod on each crank pin.

Large crank case doors for access to bearings; all cylinders, valves, etc., conveniently located.

Six-cylinder engine.

Perfect intercooling, low air velocities.

Full floating piston pins.

Free air unloading system.

Simplate valves.

Full force feed lubrication.

Self-adjusting trouble-free clutch.

Cast steel deck.

Chicago Pneumatic 2-Stage Air-Cooled Compressor.

The compressors are made in four models, as follows:

Model number	105	160	210	315
Actual capacity, cu. ft. free air per minute	105	160	210	315
Air pressure, lbs. per sq. in.	100	100	100	100
Compressor Cylinders:				
Low pressure, number and diameter (ins.)	(1) 8⅛	(1) 9⅜	(2) 8⅛	(2) 9⅜
High pressure, number and diameter (ins.)	(1) 4¾	(1) 5½	(2) 4¾	(2) 5½
Stroke (ins.)	5	5½	5	5½
Gasoline Engine:				
Number of cylinders	6	6	6	6
Bore and stroke (ins.)	4x4¼	4½x4¾	4⅝x5¼	5¾x6

The compressors also are available in the Diesel engine-driven type.

▼

Oil-Engine-Driven Portable Air Compressor

Ingersoll-Rand Co., 11 Broadway, New York, recently doubled its line of two-stage, air-cooled portable air compressors. All six sizes are now available with oil-engine drive, as well as with gasoline-engine drive.

The oil engine, known as the "Type H," is a 4 cycle, solid-fuel-injection, spark-ignition engine, that combines the advantage of both the gasoline and the Diesel type of engine. It starts easily with a hand crank and operates smoothly, with invisible exhaust. It has high torque at reduced speeds, giving it the "lugging" ability of a steam engine.

One of the great advantages claimed for the oil-engine drive is the fuel-cost saving resulting from the use of inexpensive non-explosive fuel oils, such as household furnace oil, etc.

The six sizes of the two-stage, air-cooled portable compressor have respective capacities of 60, 85, 105, 160, 210 and 315 c.f.m. (either gasoline or oil-engine driven—except model 85, which is gasoline engine driven).

Combination Truck Compressor Unit of St. Louis County Gas Co.

Ditwiler Split Shaft Power Take-off Operating an Air Compressor

The St. Louis County Gas Co., St. Louis, Mo., recently put a combination truck compressor unit, operated by a Ditwiler split shaft power take-off, in service.

The gas company purchased the truck and air compressor, delivered them to the Ditwiler Manufacturing Co., Galion, O., for the complete installation.

A Model SD-700 Ditwiler power take-off was installed in the truck, the air compressor, hose reel, air receiver, automatic throttle control, truck governor mounted on truck chassis. Body is a special design by Ditwiler, all aluminum rolling doors to insure protection against weather and burglars, compartments and shelves for the tools and equipment necessary for compressor crew.

There is ample room for carrying men, tools and all necessary equipment for any emergency job.

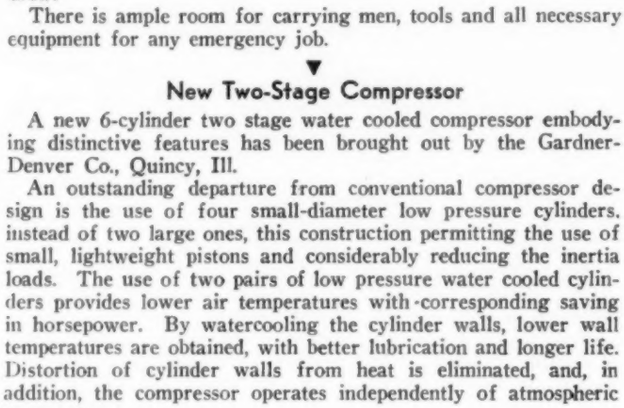
▼

New Two-Stage Compressor

A new 6-cylinder two stage water cooled compressor embodying distinctive features has been brought out by the Gardner-Denver Co., Quincy, Ill.

An outstanding departure from conventional compressor design is the use of four small-diameter low pressure cylinders, instead of two large ones, this construction permitting the use of small, lightweight pistons and considerably reducing the inertia loads. The use of two pairs of low pressure water cooled cylinders provides lower air temperatures with corresponding saving in horsepower. By watercooling the cylinder walls, lower wall temperatures are obtained, with better lubrication and longer life. Distortion of cylinder walls from heat is eliminated, and, in addition, the compressor operates independently of atmospheric temperatures.

Mountings include motor mounted on shaft; V-belt to electric motor, diesel or gasoline engines; or direct connected through flexible flywheel coupling to motor and engines.



New Gardner-Denver Compressor.

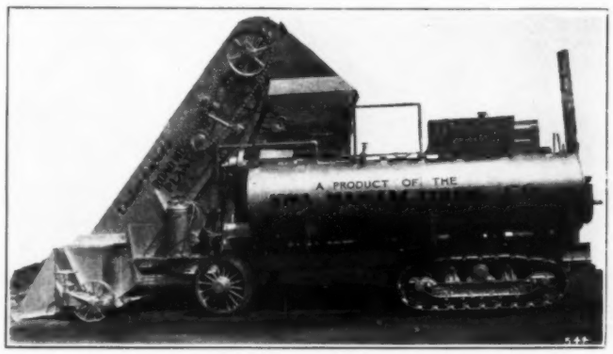
Road Mix Plants and Pavers

New "Cedar Rapids" Road Mix Plant

The new traveling road mix machine of the Iowa manufacturing Co., Cedar Rapids, Ia., mounted on half tracks in the rear is illustrated. This machine has a pugmill of the continuous mix type—24 in. x 17 ft. 4 in. with ⅜-in. renewable liners, covered with steel grating and equipped with heating jackets, using exhaust from engine for this purpose. Main shaft is chrome nickel heat treated steel, 2 13/16 in. diameter with Dodge Timken heavy duty self-aligning radial and thrust bearings. Mixing paddles are cast steel with renewable chilled iron faces. Pugmill is equipped with hydraulic lift to compensate for operation on hilly slopes up to 6 per cent grades so that pugmill may operate in horizontal plane. This feature may also be used to control the mixing capacity of the pugmill.

The aggregate batcher is of the volume type—continuous feed over apron feeder, equipped with graduated discharge gate with accurate calibrations. Veeder counter attached to record number of revolutions which multiplied by feet of travel per revolution and then multiplied by cross sectional opening of discharge gate to give volumetric discharge.

The asphaltic material measuring pump is steam jacketed 3 in.



New "Cedar Rapids" Road Mix Plant

Kinney meter pump; various size sprockets furnished to give any desired proportion of asphaltic material to aggregate; sprocket sizes determine the speed at which pump revolves which in turn governs the amount of asphaltic material discharged in proportion to mineral aggregate.

The pick-up mechanism is equipped with renewable steel tempered cutting blades on spade; buckets 16 in. x 7⅜ in. x 7¼ in. malleable iron with renewable lips, mounted on double strand S102B steel chain. Elevator is full floating type with cutting blade and boot mounted on caster wheels; cutting edge is adjustable; width of front pick-up is 9 ft.; entire pick-up device may be raised off the road for cross country transporting by use of hydraulic lift which is furnished as standard equipment.

The machine weighs approximately 50,000 lb., has an overall length of 30 ft., overall width of 11 ft. 6 in., overall height of 15 ft. 6 in. A wheelbase of 12 ft. 4 in. and a tread of 7 ft. 8 in.

High traction speed is 2.99 miles per hour both forward and reverse; mixing speed traction 2 ft. to 20 ft. per minute, depending on size of windrow to be mixed.

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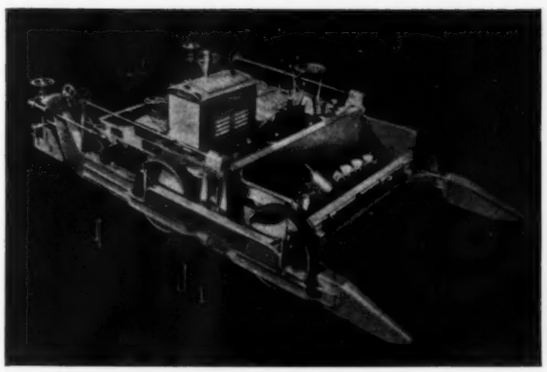
Jaeger "Self-Propelling" Black Top Paver

Announcement of this latest 1935 model black top road builder, made by The Jaeger Machine Co., Columbus, O., states that it makes possible bituminous pavement having the smooth, fine riding qualities of concrete, without the use of road forms. It is telescopic and adjustable for 9 to 15-ft. widths, and is stated to handle 400 to 1,000 tons of material per day.

Material is received in hopper from dump truck which the paver pushes forward at the speed with which spreader screw distributes the material. Instead of the usual forms the machine itself has 18-ft. long straight edge runners which are movable forms. They are full floating and carry the screed only, all other weight of the machine and road material being carried on 4 rubber tired wheels. The runners average out the subgrade and, since runners and screed float, wheels dropping into holes or irregularities of subgrade in no way affect the finish of the road.



Jaeger Self-Propelling Black Top Paver

No weight or traction is on the new road surface as runners and wheels operate on the old road or subgrade, and only the screed and blender screeds at rear touch the newly laid material. The four rubber tired wheels, operating on firm ground, will take machine with loaded hopper up any grade with no spinning of wheels or tearing of new surface—an important advantage. Runners can be lifted in 2 seconds, by power, for maneuvering on job.

Screed is standard Jaeger-Lakewood oscillating type with saw tooth front edge, tiltable for compaction, can be set for any specified crown and thickness of spread 1 in. to 6 in. and, if necessary, run to any grade wire or marker. Can be operated with one end below runners, other end 7 in. above runners, on leveling course.

Telescopic frame permits width adjustments from less than 9 ft. to 15 ft. by addition of change parts. Blender screeds, at rear of both runners, adjust laterally for spreading bled back material any additional width up to 12 in. on either side (6 in. outside runner). Ability to lay 15 ft. strip makes possible 30 ft. road in 2 sections with only one joint.

Power driven screw and heater help to break up lumps in material. Spreads laterally. Reversible screw allows operator to spread material where desired—a labor saver.

Automotive construction throughout, with 32 h.p. engine, heat treated gears running in oil, built-in differential for easy steering, banked controls and variable speeds forward of 12 to 25 ft. per minute, up to 120 ft. per minute in reverse.

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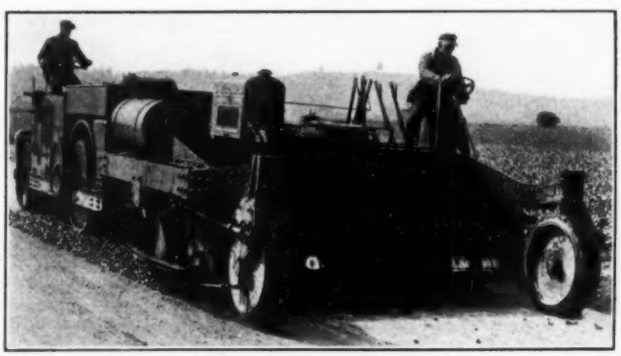
A New Adnum Black Top Paver!

The Foote Company of Nunda, N. Y., has announced a new and highly improved black top paver.

This new machine incorporates a number of new features that will be of value to the contractor. It is simpler in design, easier to handle on the road and has demonstrated an ability to lay an improved quality of pavement.

The outstanding features are a two speed cutter bar and a power cut-off. With the new cutter bar the speed may be



New Adnum Black Top Paver.

adjusted to give the best results in accordance with the density of the mix. The power cut-off permits shutting off the discharge of the mix to the road whenever necessary. This is a decided advantage in crossing intersections where grade levels are slightly different and in stopping tag end drip at the end of a change.

On the new paver controls are grouped for easy handling where the operator can easily follow the edge of the course.

A new roller lubrication device is provided to prevent material from adhering to the rollers. Scrapers also keep the rollers clean.

All the old advantages have been retained. Adjustment is provided for banking or crowning road.

Power is applied to all four wheels and with three speeds forward and reverse any traveling condition can be met.

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New Black Top Surfacing Machine

The new black top surfacing machine of the Flexible Road Joint Machine Co., Warren, O., is shown in action in the accompanying illustration. This particular job is at Greenville, Mich.—Contractor: General Paving Construction Co.—Projects NRS-41-66 and NRS-59-34, Section C-1, Kent County.

This was hot mix black top material, which consisted of a 2 in. binder course and 1 in. surface wearing course. The surface had to be finished ¼ in. higher than the forms to allow for compaction by heavy rollers. For this purpose compression dollies were used.

In front of the screed, the binder attachment, consisting of four strikeoff plates, was so arranged to strike off the material below the forms. In case of a high spot in the road, any one of the sections would automatically rise against compression

Black Top Surfacing Machine on Job at Greenville, Mich.

springs, but after passing the springs would force them to the former position. The binder attachment is equipped with indicators at each end—eight in number—so arranged that the operator can always see the depth at which the material is being struck off.

After completion of the binder course, the top wearing course was finished with a standard black top screed, which worked on the compression dollies. These dollies are adjustable so the screed can be tipped or set at any height. Wearing plates in front of the screed scrape off any material from the forms so the dolley would not ride over it.

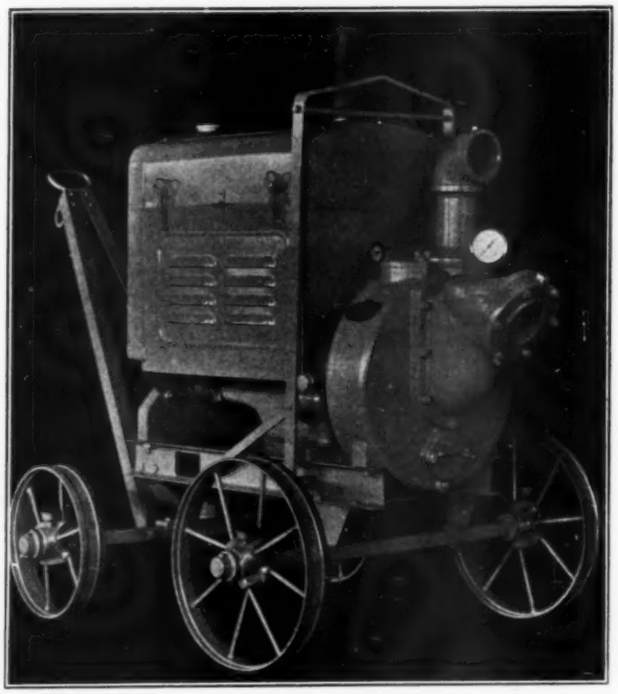
The black top machine was equipped with six wheel driving traction to prevent any slippage while screeding the heavy load of black top surface wearing course. The machine was powered with a four cylinder 12 to 16 H.P. air cooled engine. Approximately 5,000 ft. of 3 in. Heltzel black top forms were set ahead of the machine.

Pumps

New Centrifugal Pumps

A new line of self-priming centrifugal pumps, in 2 in., 3 in., 4 in., 6 in. and 8 in. sizes., has been brought out by the C. H. & E. Manufacturing Co., 120 East Mineral St.,Milwaukee, Wis.

The pumps are stated to prime easily and quickly, being absolutely automatic and having no valves or complicated internal parts. The impeller is the only moving part.



C. H. & E. 4 in. Self-Priming Centrifugal Pump

The pumps have large water passages which enable them to handle large percentages of solid material. No valves to clog or stick.

The pumps are easily portable and smooth in operation on compact, sturdy, spring mounted trailers with large wide faced steel or rubber tired wheels. An improved grease seal is stated to eliminate all packing and stuffing box troubles.

The impeller is adjustable for wear so that original high efficiency can be maintained through long periods of service.

A vacuum gauge is standard equipment on all sizes. A mushroom type steel strainer also furnished as standard equipment. Lifting bail is furnished for easy handling in tight places.

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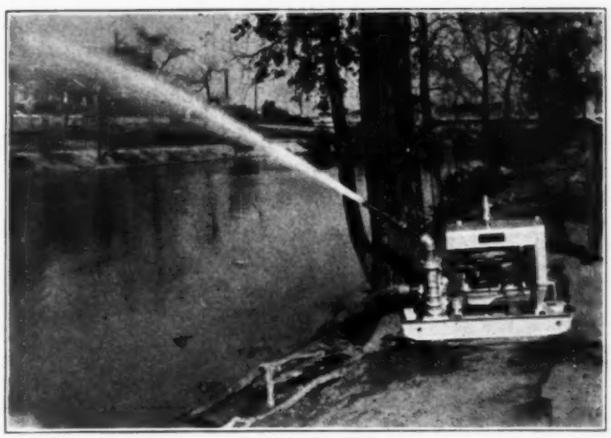
New Jetting Pumps

Sterling Machinery Corporation of Kansas City, Mo., has developed some unusual single stage high pressure centrifugal pumping units for use in jetting on pile driving jobs, placer mining work, hydraulicking, river bank washing, ponding and jetting, mud pumping on well drilling work, etc.

The first unit placed in service about a year ago on ponding and jetting work on road fills by Kuhn & Pyle Construction Company of Pattonburg, Missouri, has proved exceptionally satisfactory. This unit operates twenty-four hours per day. Layne-Western Company recently used one of these single stage high pressure centrifugal pumping units as a mud pump on well drilling in Nebraska and Addison Miller, Inc., of St. Paul, Minn., replaced a three stage pump and a 120 H.P. engine on pile driving work at Rulo, Neb., with a Sterling single stage jetting pump direct connected to 50-70 H.P. Waukesha gasoline engine power unit.

Sterling single stage high pressure centrifugal pumps are very ruggedly constructed as they are designed to withstand the abrasive action of material in the water. They differ from



Single Stage High Pressure Centrifugal Pump Discharging Water Through 2-in. Nozzle.

the usual multi-stage pumps developed for use in power plants and for other permanent installations where clear water is pumped and where careful attention is given in that they are very simple having few wearing parts made very heavy so as to be readily adaptable for hard use on construction work.

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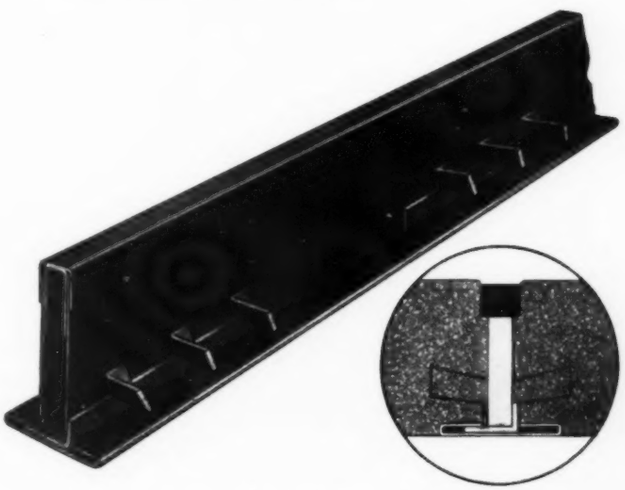
Pavement Joints

New Translode Air Expansion Joint

A new development in the construction of an air type expansion joint was recently made by Highway Steel Products Co., Chicago Heights, Ill. The "Translode Aircore" expansion joint employs the Translode base, a series of 12-in. angles, 3-in. x 2½-in. x ¼-in., provided with three 3-in. anchoring lugs on the vertical leg, placed in a metal base sleeve alternately with respect to each other, which carries a maximum load across the joint without the use of dowel bars.

The "Translode Aircore" joint is constructed with removable



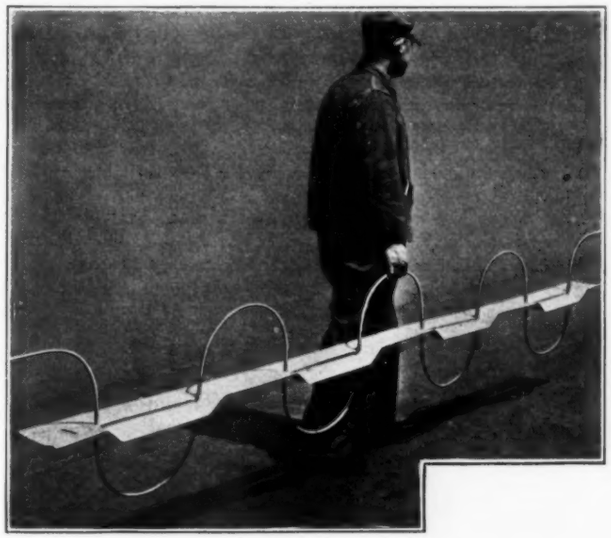
New Translode Air Expansion Joint.

forms and when installed it has the appearance of an all-metallic air joint. After the concrete has set the cap is removed permitting the side wall forms to collapse and be lifted out of the air chamber. The forms provide a narrow ledge in each slab 1½ in. from the surface of the pavement.

After the forms are removed the top of the joint is sealed with a continuous strip of cork or sponge-rubber which is placed into the joint under compression. The ends of the joint are sealed with ¼-in. steel plates.

Lacing the Nation's Roads

The illustration shows a section of the Smith metal laced joint being carried into place—and which will run in a longitudinal position between slabs. The result, in engineering language, will be a lacing together of the slabs plus an interlock or transfer of load vertically. In other words, the tying feature conforms to the well known rule that "small members closely spaced are more effective than larger members widely spaced."



Section, Smith Metal Laced Joint

The section consists of but two parts and handles as a single unit. The entire procedure, it is claimed, is quite simple and adds greatly to road life and strength. The Smith metal laced joint is a product of the A. O. Smith Corporation, and is distributed nationally by the American Steel & Wire Co.

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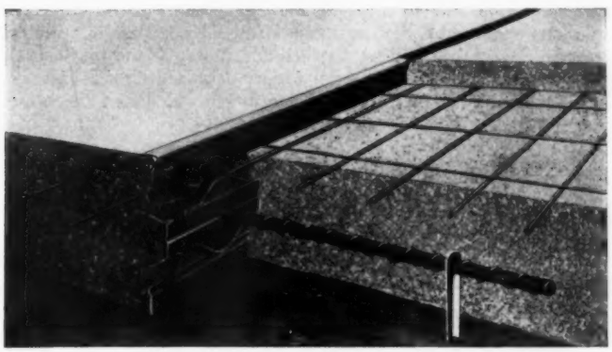
New Contraction Plate for Concrete Roads

An expanded contraction plate has been developed recently by the Tuscon Steel Co., Youngstown, O., for providing a definite plane of weakness in the pavement that forms a straight, regular crack when the concrete slab expands or contracts. In concrete road construction the contraction plate is used in combination with the reinforcing steel. The plates are placed transversely at regular intervals, and longitudinally down the center of the slab.

For transverse joints the contraction plates are placed with the top edge from ½ to 1 in. below the surface of the finished



Truscon Expanded Contraction Plate

road. The concrete is poured in the regular way, completely covering the plates, and there is no interference with the finishing, whether by machine or hand.

The Truscon expanded contraction plates are rolled from steel plates that are rigid, substantial and easy to handle. The dowel

in the plate dovetails the adjacent sections of concrete slabs. The plates are either pinned to the subgrade by means of steel stakes or by use of the improved installing devices which eliminate the necessity of the stakes. The plates are properly punched for dowel bars on 5-ft. centers and are fastened continuously end to end by means of the Truscon clip.

Distributors

New Littleford Distributor

Early in 1934 Littleford Bros., Cincinnati, O., introduced the new Model "M" pressure distributor. It is designed as a light weight, low cost outfit to apply light asphalts, tar, road oils, cutback and emulsions. Model "M" is made in standard sizes from 300 to 1,000 gal. and is a running mate for the Littleford Model "C" distributor.

The illustration shows a Model M pressure distributor being used on a mixed in place road surfacing job down in Oklahoma. A 10 ft. spray bar was used on this particular job. The prime coat was laid down on bare road as the metal had been swept

Littleford Model M Pressure Distributor on Oklahoma Job

into windrows on the side. Application was at the rate of 5/10 gal. per square yard. Material was then bladed across and allowed to set approximately two hours. It was again swept off and 3/10 gal. applied. Oil was again applied, material given two turn-overs and then bladed to an even surface. Rate of bituminous application was gauged by a tachometer.

By transporting oil in supply tanks, the pressure distributor is kept in constant operation and speed of application is greatly increased. There is no lost time through sending the distributor back to its base to be filled. The job above is an actual demonstration of this. From the time the supply tank drove alongside the distributor until the load was transferred, just 4 minutes elapsed. Several loads were checked and it was found that actual time required to transfer the oil proper required only 2 minutes and 55 seconds, balance of time consumed was taken up while attaching hose.

The Hvass Bituminous Distributor

The latest distributor of the Chas. Hvass & Co., 508 East 19th St., New York City, is illustrated below. The tank is elliptical in shape, and is of electric welded construction of high grade tank steel. Four 7-in. return tube type flues carry the hot burning gases forward and return them to back; eight 3-in. flues assist in distribution of the heat through body of material in the tank. The entire outside of the tank shell is covered with 1¼-in. rock wool.

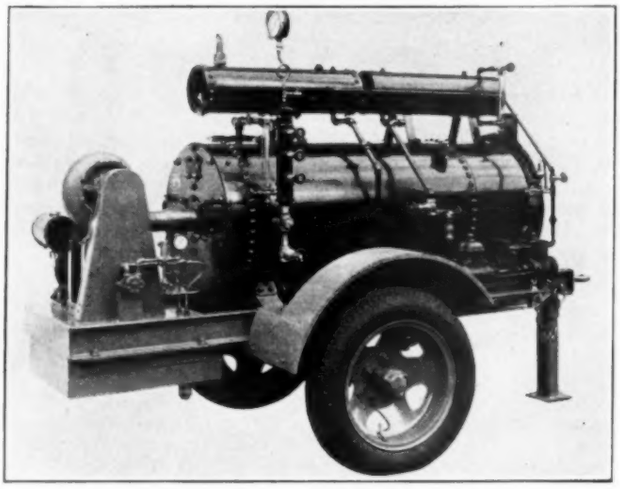
The pump is the Viking rotary type, 4-in. suction, 3-in. discharge, capable of discharging 300 gal. per minute at 300 r.p.m. The engine is a 4-cylinder, 4 cycle, 30 HP. unit, with American Bosch magneto, Zenith carburetor, water cooled pump circulation, pressure feed lubrication, gasoline tank, radiator. Enclosed gear reduction, Twin disc clutch. Engine and pump are mounted in steel channel sills set crosswise of frame between cab and tank. Engine runs at constant speed. The heating equipment consists of two large kerosene burners of torch generating type. The distributor manifold is of the quick detachable type, and can be swung from side to side to match swath or clear obstructions. The distributors are built in several types: Type 100-D, Type 200-D and Type 500-D, and in sizes ranging from 250 to

Hvass Bituminous Distributor, Type 100-D

1,800 gal. capacity. They are self-contained units which can be mounted on motor truck chassis, semi-trailer or four wheel trailer chassis. They will heat and apply any class of bituminous material.

One-Car Heater

The illustration shows a one-car heater, a product of the Cleaver-Brooks Co., Milwaukee, Wis. This is portable and completely self-contained, including a small gasoline motor to drive the blower. The boiler is of high efficiency (80 per cent) and very compact. An added advantage is that no stack is required



One-Car Heater Unit of Cleaver-Brooks Co.

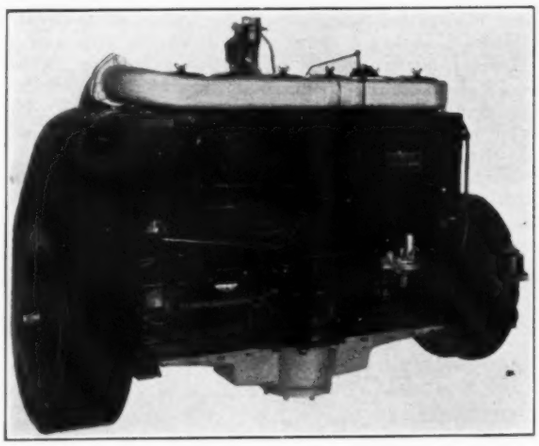
and the steaming is very rapid (30 minutes from a cold water start to 100 lbs. pressure). A return condensate system does away with a water wagon; only about 50 gal. are required per car and the boiler is kept free from mud and lime.

These heaters have many other uses such as thawing culverts and manholes, cleaning machinery and heating concrete aggregates.

Engines

New Direct Air-Cooled Engine

A new and improved design of the Domark engine was announced by the Doman-Marks Engine Co., Amesbury, Mass. An outstanding characteristic of the Doman-Marks engine is the direct air cooling of its cylinders. The cooling air is supplied by a large centrifugal blower mounted on the crankshaft. From this blower the air is divided into two distinct streams. One stream is directed to the cylinder heads, while the other stream is directed onto the cylinder barrels. This eliminates eddy currents in the ducts and thus improves the cylinder cooling. The blower is of a very efficient design and requires a surprisingly small amount of power to drive it.



Generator Side, Three Flange Exhaust System, with Inlet Manifold Heater

Other features of the engine include the following: The individually cast cylinders of chrome-nickel iron are screwed into an aluminum head while at a high temperature, thus making a permanent union. Accessibility of cylinder fastenings makes a valve grinding job as simple as other constructions, while cylinders facilitate repairs and expense. The crankcase is cast iron and exceptionally rigid. Lubricating oil is forced under pressure to all wearing parts, including the piston pin which floats in a bronze bushing in the rod and in bosses of the specially designed aluminum piston. Oil is also forced under pressure to all bearings of the overhead valve parts.

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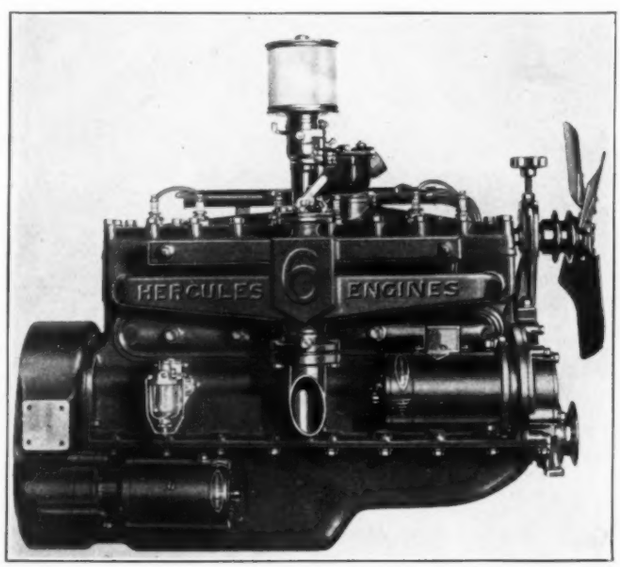
New Hercules Engines

Recent additions to the line of the Hercules Motors Corporation, Canton, O., includes the "2X" series of gasoline engines, the Model DRXB Diesel engine and the JXD, a larger model of the "JX" series of 6-cylinder gasoline engines.

In the "ZX" series has added the following models to their present line of modern and advanced heavy duty four- and six-cylinder engines, thus giving a complete range of sizes of from 4 to 200 HP.:

Model	Bore	Stroke	Displacement
XZA	2½	3	58.8
ZXB	2⅝	3	64.9

The two models are identical in general design and the majority of the parts are interchangeable, the only difference being in the bore sizes and the parts affected thereby. The maximum torque of the ZXA is 37 lb. developed at from 1,500 to 2,400 r.p.m. and on the ZXB is 40 lb. developed from 1,500 to 2,400 r.p.m. Both models peak at 4,000 r.p.m., the ZXA developing 22 HP., the ZXB 24½ HP. at this speed.



Hercules JXD Engine

The Model DRXB is an addition to the line of six cylinder Diesel engines in their Model DRXB—3⅜x5¼ in. This engine with a displacement of 474 cu. in. (7.77 liters) and an N. A. C. C. rating of 45.9 HP. develops 120 HP. at 2,000 r.p.m. and a maximum torque of 340 ft. lb., this torque curve being exceptionally flat, varying but 40 lbs. from 600 r.p.m. up to 2,200 r.p.m.

This engine interchanges with the Hercules gasoline engines known as the "YX" and "RX" series in installation measurements.

The engine is a full Diesel of the auxiliary combustion chamber type which controls the burning of the fuel and makes this engine very powerful for its displacement as well as smooth running, flexible and economical.

The JXD is a larger bore model of the "JX" series of 6-cylinder gasoline engines. The JXD is a 4x4¼-in., 320 cu. in. displacement.

This engine develops 83.8 HP. at 2,800 R.P.M. and 65.5 HP. at 1,800 R.P.M. with maximum torque of 204 ft. lbs. at 1,000 R.P.M. (N. A. C. C. Rating 38.4 HP.). A 2½-in. chrome molybdenum crankshift is supported by seven bearings of the high lead bronze precision type. The cylinder and crankcase are cast integral of molybdenum alloy iron. Cylinder head is detachable, the "L" head design being fitted with exhaust valves 1⅜-in. clear diameter—inlet valves 1½-in. clear diameter.

Lubrication is forced feed by geared pump to all connecting rod and main bearings, oil thrown off from the rods lubricating the cylinder walls. Aluminum alloy pistons are fitted with four rings all above the piston pins—an oil control ring 3/16 in. wide and three compression rings ⅛ in. wide.

A four bearing camshaft located on the right-hand side of engine looking from flywheel has all cams forged integral.

All connecting rod bearings of high lead bronze precision type are 2 in. in diameter, the length of rod being 8 in. from center to center. Either a 1¼-in. or 1½-in. carburetor can be installed, and a distributor mounting is provided on left-hand side where the centrifugal water pump is also mounted. A magneto mounting is available as optional equipment.

This "JXD" is supplied with No. 3, No. 4 or No. 5 bell-housing for 3 or 4-point suspension and flywheels for any standard clutch.

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Wisconsin 4-Cylinder Air-Cooled Engine

One of the outstanding developments of the year just past, of the Wisconsin Motor Corporation, Milwaukee, Wis., is the Wisconsin model "AC4," 4-cylinder, 4-cycle, air-cooled engine. It is of the heavy-duty type, having a 2⅝-in. bore and 3¼-in. stroke and a piston displacement of 70.35 cu. ins. Power developed ranges from 6 H.P. at 1000 R.P.M. to 16 H.P. at 2600 R.P.M. Exceptional light weight is one of the features of this engine, the engine with accessories weighing only 230 lb. and the complete power unit only 290 lb. The overall length is 20¼ in.

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Scintilla Vertex Magneto for Ford V8 and for Engines Requiring Two-Spark Ignition

At the coming shows Scintilla Magneto Co., Inc., Sidney, N. Y., will announce two magneto installations, both part of its "Vertex" series. One new product is a magneto installation for Ford V8 engines, 1932 to 1934 models. The magneto is mounted in place of the standard Ford timer by means of an adaptor, no alteration to the engine being required. All new parts needed are supplied with the outfit including cable tubes, brackets, studs and an adaptor plate for the ignition switch.

The other product is a two-spark magneto unit for engines having two spark plugs per cylinder but only one magneto mounting pad. This unit consists of two Vertex magnetos mounted on a single base and driven from a horizontal shaft by spiral gears. The drive shaft runs on ball bearings and has a magneto taper shaft end to facilitate coupling to the engine shaft. The unit is available for engines of 4, 6, 8 or more cylinders with automatic spark advance if desired. Unlike conventional two spark magnetos this installation comprises two ignition systems, each electrically independent in every respect.

Trucks

New Streamlined Truck Models

The new streamlined International trucks announced by the International Harvester Co., Chicago, Ill., include models ranging from ½ to 5 tons in capacity. The forerunner of this new line, the half-ton Model C-1 announced some time ago, has met with enthusiastic approval and the larger models now being shipped from the factory carry the same distinctive lines and attractive finish.

The new models include the C-10 and C-20, ¾ and 1½ ton rated capacity respectively, powered by 4-cylinder engines. The

New International Model C-55

C-10 has 133-in. wheelbase and the C-20 is built in two wheelbases, namely, 133 and 157 in. The C-30 is a 6-cylinder model with 133 and 157-in. wheelbases. The 6-cylinder Model C-35, available in 136, 160 and 175-in. wheelbases, is powered by an International Harvester Model FAB-3 valve-in-head engine which develops 78 h.p. at 3400 r.p.m. and 160.4 pound-feet torque at 800 r.p.m. Compression ratio is 5.4 to 1 and displacement 222.7 cu. in. The rated capacity of this model is 1½-2 tons, with a maximum allowable gross weight of 10,400 lb.

The Model C-40, rated at 2-3 tons with a maximum allowable gross weight of 13,000 lb. is equipped with the same power plant as the C-35 but instead of a 4-speed conventional-type transmission the C-40 has a 5-speed transmission with one reverse. Helical constant-mesh gears in third and fourth speeds assure quiet operation. This model is available in 145, 155, 170 and 185-in. wheelbases.

The Model C-50 has a maximum allowable gross weight of 16,100 lb. with a rated capacity of 3 to 4 tons. It is built in 145, 156, 170 and 185-in. wheelbases. This model is powered by the 6-cylinder valve-in-head International Model FBB engine, which like the FAB engine employed in the Models C-35 and C-40 has replaceable cylinders, exhaust-valve seat inserts, replaceable precision-type bearings, and other features which contribute to its economy and efficiency. The Model C-50 engine has a 3⅝-in. bore and 4½-in. stroke with displacement of 278.7 cu. in. It develops 82.3 h.p. at 2,800 r.p.m. governed speed and a peak torque of 191 pound-feet at 800 r.p.m. The rear axle is of the spiral bevel gear full-floating type.

The Model C-55, built to carry a total of 14,000 lb., including body, cab and equipment, and rated at 3½-4½ tons, has a maximum allowable gross weight of 21,500 lb. The Model C-60, 4-5 tons, has the same maximum allowable gross weight.

These models are alike with the exception of the rear axle. The Model C-55 has a spiral bevel drive-gear rear axle, while the Model C-60 has a double-reduction axle with herringbone gears for the first reduction. Both rear axles are of the full-floating type. These models are built in 140, 156, 170, 190 and 210-in. wheelbases. The power plant of the Models C-55 and C60 is the 6-cylinder International Model FBB-3, also of the valve-in-head type, with replaceable cylinders, valve-seat inserts, and other important features. This power plant—bore, 3¾ in.; stroke, 4½ in.; displacement, 298.2 cu. in.—develops 90.4 brake horsepower at 2,800 r.p.m., its governed speed. Its peak torque is 213.5 pound-feet at 800 r.p.m.

All these new Internationals are of the same streamlined design which is carried out in cabs and in panel bodies. Suitable body types to meet all hauling requirements are available for each of the new Internationals.

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"Underslung Power" Trucks Announced by White Motor

An ultra-modern motor truck with "Underslung Power," is announced by The White Motor Co., Cleveland, O., for heavy duty service in city and inter-city transportation.

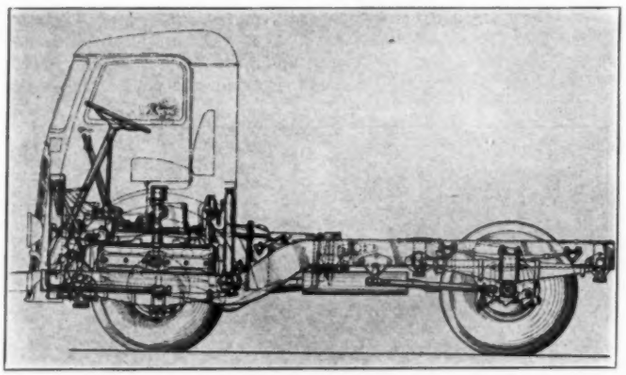
These new trucks are claimed to represent an entirely new principle in heavy duty hauling. White discarded all conventional practices and developed new engineering ideas to achieve these new trucks.

The engine—a 12-cylinder horizontally opposed "pancake engine" is an exclusively White design and is the only one of its kind in commercial vehicles. This unique design was achieved by opening the angle of a "V" type engine so that the two banks of cylinders, containing six each, are horizontally opposed.

The engine is placed underneath the floor, with the cab moved forward to the extreme front end of the truck. Through this modern arrangement of power plant perfect weight distribution is stated to be achieved, with the lowest center of gravity, providing for greater payload space on every wheel-base.

Outstanding features include: Shortest overall length with greater maneuverability. White screwed in Stellite valve seats, interchangeable wet sleeves, dry sump lubrication, full floating rear axle, silent transmission, unusually wide tread front axle, air brakes, exceptional visibility and other safety features.

Valves are on the underside of the engine—at the lowest



Drawing of Chassis of Model 731

point of the cooling system—insure long life by eliminating the hazard of low water.

The fan is beltless, being driven directly off the end of the crankshaft, circulating cool air over the engine preventing all heat from reaching the cab. The engine is easily reached through the floor boards of the cab or quickly removed on a dolly.

This new truck is available in 24,000 to 30,000 lbs. gross weight trucks and tractor-trailer units and six wheels for heavier loads. Wheelbases range from 108 to 180 ins.

Two New Dump Truck Models

The Hug Co., Highland, Ill., manufacturers of the Hug roadbuilder truck, have announced the addition of a new series of motor trucks, including two important dump truck models.

The new models consist of the 15 and 19 series; each series has three standard models designated as A, D and T. The "A" designating straight commercial trucks, the "D" the dump truck and the "T" the tractor model.

In offering a special model for dump truck service, The Hug

Model 190 with Closed Cab and 2 Yd. Body and Hoist

Company maintains its policy of building specialized dump truck equipment.

The Model 15-D is rated as a 1¾ to 2½ ton truck with a gross rating of 11,500 lb. and can be furnished with 1½ to 2 yd. power hoist bodies, with optional single and dual tire equipment.

The Model 19-D is rated as a 2½ to 3 ton truck, with a gross rating of 14,500 lb. This model is available in 2 and 3 yd. body capacities and comes equipped with a 5-speed forward, 2-speed reverse transmission.

Both the new Hug dump models carry the exclusive Hug front axle rocker action. This feature has been furnished as standard equipment on all Hug roadbuilder models for the past four years. This front axle action gives an independent free action for each front wheel and yet maintains a sturdy front axle design. Uneven road conditions are absorbed by the rocker action and twisting of cab, hood and radiator, and bending of frame members are eliminated.

With the addition of the two new dump models The Hug Co. completes its line of roadbuilder models and is now in a position to furnish trucks ranging from 1½ yd. to 12 yd. designed to meet any dump truck hauling requirement.

▼

New 1½-Ton High-Speed Truck

Combining beauty and graceful lines with the high horsepower used in their entire line of trucks, the Four Wheel Drive Auto Co. of Clintonville, Wis., has developed a new ton-and-a-half speed truck which they have designated as

New Model HS 1½-Ton Truck

Model HS. Their engineers have directed special attention to speed, sturdiness, ease of steering, smoothness of riding, reliability, and safety on the road. The specifications call for a road speed of 47 miles per hour, with full load.

The new model is propelled by an 84 HP. engine which develops 185 foot-pounds torque. The fundamental principle of applying power equally to all four wheels, which is used in all previous models of the Four Wheel Drive Auto Co.'s line, is retained in the new model HS. Each of steering and simple handling is increased by setting the front axle back 42½ in. from the front bumper. The HS model employs this setback-of-front-axle principle also to secure equal distribution of load. This new entry in the truck field is built for heavy duty as well as fast traveling. The 6.50-20 tires are dual in the rear.

The new speed truck is convertible from an all-four-wheel drive to front-wheel drive or rear-wheel-drive—in cases of emergency. The chassis weighs 5,220 lbs. including the cab. The gross weight is 11,200 lbs.

Wheelbase, and body space back of the cab, are made variable according to the demands and needs of the purchaser. Thus with a 132-in. wheelbase, 120 ins. of clear space for load is available back of the cab, while a 121-in. wheelbase gives 96 ins. of body space, and 142-in. wheelbase allows 144 ins. for load use.

The power-plant consists of an FWD six-cylinder BK type engine. The patented, built-in governor is adjustable, sealed, self-lubricating, and non-hunting. A seven-bearing crankshaft, battery ignition, wire-mesh type of air-cleaner and mechanical fuel feed gives the engine smooth-running sturdiness.

Complete control of this speed-truck is maintained through four-wheel hydraulic brakes operated by a vacuum booster.

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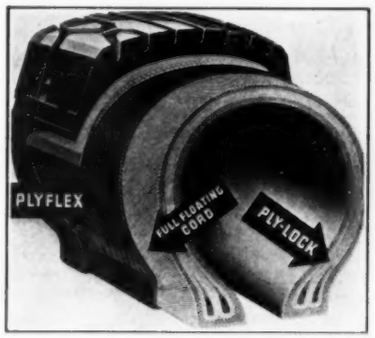
New Truck and Bus Tire

A newly developed truck and bus tire, with improvements over previous construction, was announced by The B. F. Goodrich Co. this spring. The new tire known as the Goodrich triple protected Silvertown has three new protection features, Plyflex,



Cross Section Showing Construction of Tire

Ply-lock and 100 per cent full floating cords, the manufacturer says.

Plyflex is a new, tough, sturdy rubber material and the new tire has a layer of it protecting the side-wall. It bears the brunt of the strains caused by the tire flexing several hundred times a minute, distributes stresses throughout the carcass and prevents local weakness.

Ply-lock is a new process of locking the continuous plies of the tire around the bead, anchoring them in place and floating the tapered ply ends in rubber. Its use prevents the plies tearing loose just above the bead, a trouble often found in tires using short reinforcement plies, instead of this new type construction.

Full floating cord fabric used in the new product is completely "floated-in-rubber," so that every cord is entirely surrounded by rubber. This process, it is claimed, makes it possible to extend the life of the tire, since it runs cooler due to the absence of friction causing cross-cords.

Two other new products, the Gold and Black tube which offers greater resistance to tear and rim chafing and the Seal-O-Matic safety tube, an utterly new type puncture sealing tube for passenger cars, also were announced by Goodrich.

Tractors

New Diesel Tractor

The Cleveland Tractor Co., Cleveland, O., announced the Cletrac 35 Diesel, which delivers a maximum of 46 horsepower at the drawbar. The engine is of the same general construction as the engine which has proven so satisfactory in the Cletrac Diesel 80. These engines have been in operation thousands of hours, working under all kinds of conditions. Embodied in the Cletrac Diesel 35 are the features of the Cletrac 35 gasoline

Cletrac 35 Diesel Tractor

tractor which has been tried and proven by years of service in both agricultural and industrial work.

The Cletrac Diesel 35 engine is of 6-cylinder design, 4⅜ in. bore by 5¼ in. stroke and operates at 1200 r.p.m. It has seven main bearings and the crankshaft is balanced with integral weights, resulting in a well-balanced, smooth operating engine. Removable liners are provided in the cylinder block.

A distinguishing characteristic of the Cletrac 35 Diesel is that it is equipped with electric starting which has proved so successful on the Cletrac Diesel 80. The Cletrac 35 Diesel is stated to be the first full diesel tractor in its power class to offer this convenient and money saving feature.

Standard equipment includes electric starting, radiator guard, crankcase guard and wiring for lights.

▼

"Caterpillar" Twenty-two Tractor

The triple economy of low first cost, operation on inexpensive fuels and the power savings of track-type traction are among the many outstanding features of the new "Caterpillar" Twenty-two Tractor, according to an announcement issued by Caterpillar Tractor Co. of Peoria, Ill.

The new model is powered with a 4-cylinder, 4-cycle, valve-in-head engine developed especially for converting a wide range of low volatility fuels into efficient, dependable tractor performance. The engine has a 4-in. bore and 5-in. stroke and develops a maximum horsepower of 23.69 at the drawbar and 28.39 on the belt at governed speed of 1,250 r.p.m. Lubrication is force feed to all main, connecting rod and rocker arm bearings. A twin fuel tank holds 20 gal. of tractor fuel and 2 gal. of gasoline, which is used in starting, and a 3-way fuel controlvalve is located on the dash in easy reach of the operator.

The fuel and cooling systems, manifolds and cylinder head have all been designed to give uniform, high operating efficiency in handling low cost fuels. The carburetor is located directly beneath the heated manifold jacket and a heat exchange valve is provided to insure thorough vaporization of the fuel before it enters the cylinder. Water circulation is controlled with a thermostat and a radiator by-pass allows the engine to warm up rapidly. The new Eisemann magneto, with which the tractor is equipped, is of the stationary winding inductor type, which requires no lubrication and is also said to be simpler and more accessible than magnetos formerly used in tractor service.

The Twenty-two is available in either standard or wide gauge models. The standard machine has a shipping weight of 6,150 lb.

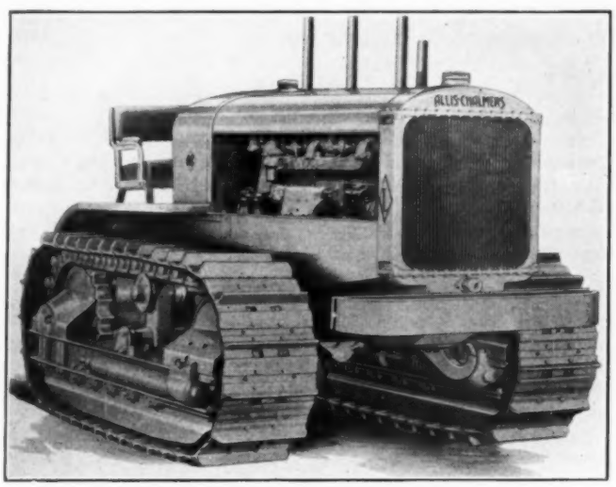
▼

New A-C Oil Tractors

Allis-Chalmers, Milwaukee, Wis., in announcing its new "KO" and "LO" oil engine tractors, culminates over ten years of intensive study of engines that will burn cheaper grades of distillate fuel oil. These new engines are claimed to have all the advantages of the high compression type without the disadvantages.

They burn any grade of commercial Diesel fuel that is within the limits of viscosity, free from sulphur, and clean. The best fuels from which the most efficiency will be obtained are commercial Diesel oils, grades 2 and 3. These new oil engines start by either hand cranking or electric starter. This is possible because of the low compression of the engine (125 lbs.). No special starter or auxiliary engines are necessary.

Fuel oil is injected into the cylinders under pressure through the Bosch Diesel fuel pump and injectors. This fuel injection is positive and always controlled by the governor of the tractor.



New Allis-Chalmers Oil Engine Tractor

Ignition of the finely sprayed fuel oil is from the ordinary spark plug and time tried magneto. Positive, simple and well understood by the average operator and mechanic.

The weights of the "LO" and "KO" are 23,000 lbs. and 11,200 lbs., respectively, in keeping with the horsepowers of the tractors. The "LO" standard is equipped with front bumper, pull hook and 20-in. track shoes.

▼

New Heavy-Duty Tractor

The Model GL Trackson-Case Crawler-Tractor was put into production by the Trackson Co. of Milwaukee, Wis.

The unit is powered by the Model L Case motor, weighs 8,000 lb. and develops approximately 40 drawbar horsepower. This ratio of power to weight meets the demand for maximum power with minimum weight. Its track area in contact with the ground is extra large, and harnesses the power so completely that the effective drawbar pull is unusually high.

Designed to work with super-imposed auxiliary equipment, the GL tractor has a low center of gravity, wide tread and special balance to provide the best stability with front, rear and side loads. The crawlers have extra large load supporting bearing area, great structural strength and provisions for proper in-building of equipment, such as booms, cranes, hoists, etc.

The improved heavy-duty crawler track has single drive lugs that form a rail upon which the front and rear crawler wheels run. The front wheels are of sheave type, while the rear wheels have drive teeth independent of guide flanges. This design assures positive action, proper alignment under all operating conditions and provides maximum load carrying capacity.

New Small Tractor

The new McCormick-Deering I-12 shown in accompanying illustration is a small, compact, low-priced tractor that International Harvester Co., 606 S. Michigan Ave., Chicago, Ill., recently added to its line of industrial tractors.

The I-12 is 96 in. long overall, 50 in. wide overall, and 52

New McCormick-Deering Tractor

in. high over the steering wheel, and its turning radius is only 103 in. It has an unusually flexible speed range from a low of 2½ miles an hour up to 10¼ miles an hour, with foot accelerator and hand control. Brakes of internal-expanding type are operated by foot pedal.

Features of the four-cylinder, valve-in-head International-built engine are replaceable cylinders, downdraft carburetion, induction-type magneto, oil air cleaner, and oil filter with a metal element that may be easily cleaned. Efficient operation is facilitated by the use of seventeen ball bearings and six tapered roller bearings. Easy steering is made possible by mounting steering worm on roller bearings.

The rear axle is designed for uniform stress to withstand loads all the way across. It is semi-floating and mounted on four ball bearings; oil seals give protection against grit and dirt. Muffler, pintlehook type spring-cushioned drawbar, and comfortable spring seat are regular equipment. Accessible machined surfaces are provided for the mounting of various types of industrial equipment to be operated by the tractor. The frame is of two-piece bolted construction—transmission, countershaft and differential, rear axle and final drive gears are enclosed.

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McCormick-Deering Diesel-40 Tractractor

The McCormick-Deering Model TD-40 or Diesel-40 Trac-TracTor of the International Harvester Co., Chicago, Ill., is operated by a four-cylinder, four-stroke-cycle, valve-in-head Diesel engine and is equipped with the same type of chassis as the McCormick-Deering six-cylinder T-40 TracTracTor.

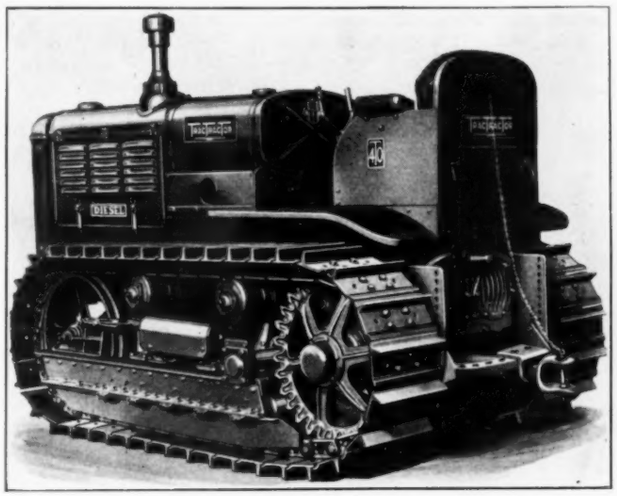
A distinctive system of starting makes it possible for the operator to crank the McCormick-Deering TD-40 TracTracTor engine as easily as a gasoline engine of corresponding size. To do this, a special device set by operator but automatically disengaged is employed to reduce the compression pressure and place in operation a gasoline carburetor and magneto. In starting, then, the engine is operated as a conventional gasoline engine until this automatic device cuts out and shuts off the connection to the carburetor and the spark plugs and disengages the magneto, thus restoring full Diesel pressure. The engine then operates on the regular Diesel cycle.

In building the fuel supplying system of the TD-40 engine, great manufacturing care and skill are required and dimensions must be held to unusually close precision limits. The injector pump, by-pass, and injector nozzle, for instance, are made in a special shop where temperature and humidity are carefully controlled and the air is thoroughly cleaned. The injector pumps are assembled as a unit with the governor; the starting release, and two fuel-oil filterers, and may be readily removed as such and replaced, thus obviating any need of field adjustments. Various parts of this unit are of stainless or other rust-resistant steels or are Parkerized to protect completely against corrosion.

The engine operates at compression pressures of approximately 550 to 575 lbs. per square inch. The volumetric compression ratio is 17:1. Cylinders are vertical and of 4¾ in. bore and 6½ in. stroke. The engine operates at four controlled speeds of 1,100 r.p.m. and under, and since the transmission provides five speeds the tractor may move at twenty different forward speeds—a traveling flexibility that is quite unusual. The five tractor forward speeds at full-load governed engine speed of 1,100 r.p.m. are, respectively, 1¾, 2¼, 2¾, 3¼, and 4 miles per hour. Reverse speed is 2¼ miles per hour.

Fuel to each cylinder is filtered five times and passes through two sediment traps. Full-injection nozzle for each cylinder is of the closed, single-hole type. The maximum engine horsepower is 52, the maximum drawbar horsepower, 44.

The McCormick-Deering TD-40 TracTracTor is a ruggedly built crawler tractor. Accessibility of various parts is especially worthy of mention. Steering clutches and steering brakes may be easily inspected, adjusted, or removed through rear cover plates without disturbing tracks, track frames, and



McCormick-Deering Diesel-40 TracTracTor

driving sprockets, thus making for surprisingly low maintenance cost. Special dust seals guard every shaft and bearing. Overall length is 140 in.; overall width, 63¾ in.; height over exhaust pipe, 87¼ in.; and drawbar heights, 17¾ in., high, and 11 in. low. The tractor readily turns within a circle of 7-ft. radius.

▼

New Bates Tractor

The Bates Manufacturing Co. of Joliet, Ill., builders of the Bates steel mule, announce a new model 35. This new tractor incorporates all the advantages of the old Bates 35 and brings many new features.

Improved design provides greater riding comfort, greater steering ease, smoother operation and longer life. The rear end engine vibration is eliminated. This has been accomplished by a unique design for the main engine clutch and transmission. The main engine clutch contains a unique supporting feature in that the weight of the clutch parts is supported midway of two bearings. The transmission gear shaft extending from the clutch is supported on two bearings, one of which is the same bearing as is used on the clutch shaft. A gear type coupling is incorporated between the clutch shaft and transmission shaft so that the necessary flexibility is obtained between the two members and each bearing has its proportionate loading.

In the crawlers, the crawler housing supporting the track idlers has been extended to give greater protection to the drive sprocket. The wide track rail has been retained and through the installation of a specially designed electric furnace of the continuous type, uniform heat treating of track shoes has been made possible.

Greater clearance has been introduced between the truck wheel flanges and track rails, assuring longer wear before flange replacement is necessary.

The braking pressure of the steering brakes has been increased and the crawler can be stopped with a relatively light pressure of the foot. The standard Bates brake lock is mounted on the left-hand brake pedal.

The drag links between the steering clutch operating levers and the bell cranks on the clutches are adjustable at both ends. This permits maintaining the hand-steering lever and bell cranks in a constantly relative position regardless of the wear of the steering clutch faces, and in addition, takes up the wear of both ends of the drag link.

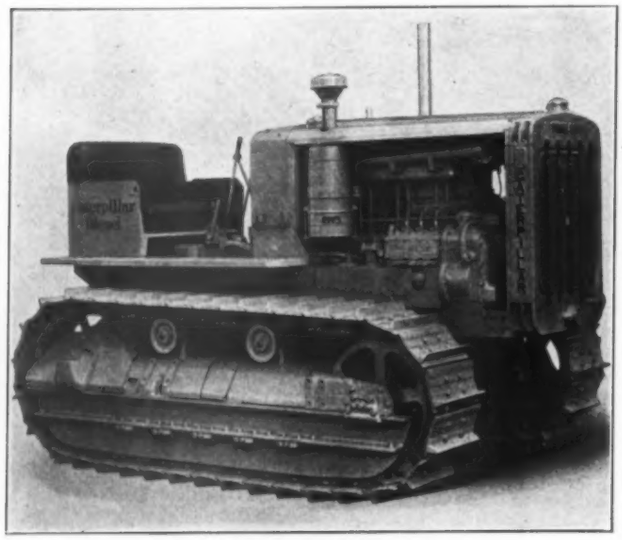
The new Bates Model 35 Tractor has a drawbar pull of slightly over 43 HP. and can be powered for either Diesel, oil or gasoline.

▼

"Caterpillar" Diesel Forty Tractor

The Diesel Forty Tractor, announced by Caterpillar Tractor Co., Peoria, Ill., brings greater power, increased strength and the outstanding operating economy of the Diesel engine to a long list of tractor jobs, according to the manufacturers.

Its 3-cylinder Diesel engine develops 44 h.p. at the drawbar and 49 h.p. on the belt. The power of the engine is balanced by the strength of the machine itself, the announcement states.



The "Caterpillar" Diesel Forty Tractor

The track assembly and track frame feature the same rugged construction found in the largest "Caterpillar" models, including cast steel diagonal braces, enclosed recoil springs, double front idlers and heavier track links of improved design.

The Diesel Forty is built to pull a 6-8 yard wagon or a 7-8 bottom plow under most conditions. The frame is drilled for mounting such equipment as bulldozers, trailbuilders, hoists and side booms. Wide gauge models and a wide variety of track equipment are available. Shipping weight is 14,708 lbs.

▼

Grease Packed in Cartridges Now on the Market

Grease packed in cartridge form to fit a new type of grease gun are now being sold by the Standard Oil Co. (Indiana), according to announcement by L. C. Welch, assistant general manager. To fill the new type of grease gun the operator merely slips a factory-loaded cartridge into the barrel of the gun which is then ready for use.

The cartridges now being made are of 1-lb. capacity and include several grades of lubricant. This method of handling works equally well with fluid gear lubricant or fairly stiff grease. A partially used cartridge can be quickly replaced with another cartridge of different grade of lubricant, and the lubricant in the used cartridge, being enclosed, is not wasted and does not accumulate dirt.

This new lubricant system has been perfected during the past few years by the Lubrication Corporation, Chicago, a concern owned jointly by the Standard Oil Co. of Indiana and Bendix Aviation Corporation. Each cartridge has a sliding bottom which acts as a plunger to feed the lubricant into the high pressure chamber in the nose of the gun. Cartridges of larger size may be offered in the near future.

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Drag Lines, Crawler Wagons, Bulldozers, Etc.

Low Ground Pressure Features New Dragline

Low ground pressure is the outstanding feature of the new P & H Model 750-LC dragline of the Harnischfeger Corporation, Milwaukee, Wis., designed primarily for work on irrigation and drainage jobs where soft ground is encountered.

The constant manipulation of mats commonly required to provide solid footing takes time and costs money by cutting

New P & H Model 750-LC Dragline

heavily into the day's yardage. This fact moved P & H engineers to provide this machine with "mud shoes." Length of crawler has been increased to 15 ft. 9¼ in. Crawler shoes are 42 in. wide, resulting in a reduction of ground pressure to only 7.3 lbs. per square inch—extremely low for a 2-yd. machine.

The exceptionally long corduroys are securely mounted on massive through axles. Traction is provided through a simplified chain drive with fully machined gears enclosed to protect them from dirt and obstructions.

In other respects, the new 750-LC conforms to standard P & H design, with "sure feel" power clutch, "trigger" dipper trip, and other split second features.

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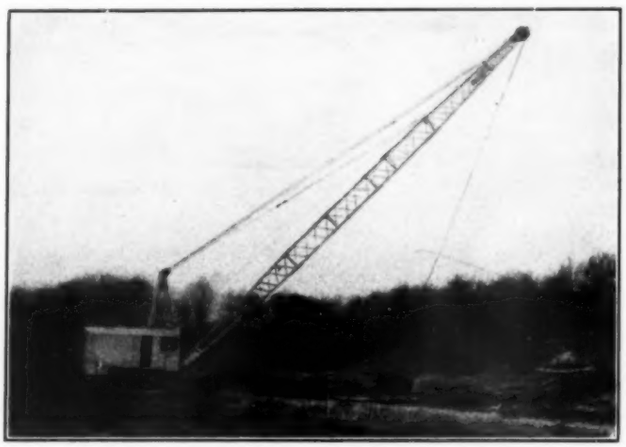
New Northwest Dragline

The latest machine announced by the Northwest Engineering Co., Chicago, Ill., is its Model 85 dragline. Advantages claimed for this machine include the following: A remarkably fast swing, great mobility, and easy operation made possible by the



Northwest Model 85 Dragline.

"feather-touch" clutch control. The machine handles a 3-yd. bucket. The general specifications are as follows:

Northwest oil engine—4-cylinder, 8 in. x 9 in.
Twin City gasoline engine—4-cylinder, 8 in. x 9 in.
Diesel engine or electric motor, on application.
Width of crawler treads, 33 in.
Overall width of crawler base, 12 ft., 3 in.
Overall length of crawler base, 17 ft., 5 in.
Length of rear half of crawler base, 8 ft., 2 in.
Length of front half of crawler base, 9 ft., 3 in.
Height of crawlers, 3 ft., 5 in.
Clearance under rotating base, *including fuel tank on rear end, 3 ft., 8½ in.; not including fuel tank on rear end, 3 ft., 11 in.
Rear end swinging radius, *including fuel tank on rear end, 13 ft., 9 in.
Rear end swinging radius, not including fuel tank on rear end, 11ft., 7 in.
Overall height to top of cab, 12 ft., 6½ in.
Overall height to top of gantry, 22 ft., 9 in.

*Fuel tank on rear end is standard on Model 85 dragline only.

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New Continental Wagon Scraper and Ripper

Two new pieces of tractor-operated equipment of the same high-grade construction as the Continental trailbuilders and grading bulldozers, have been announced by Continental Roll & Steel Foundry Co., Chicago, Ill. These are the wagon scraper

Continental Wagon Scraper in a Loading and Carrying Position.

and roll-clear ripper—both designed for the "35" to "50" crawler tractors.

The wagon scraper, of 5-yd. capacity, (1) digs or scoops, (2) loads, (3) transports rapidly, (4) windrows, (5) backfills. It is a unit that can be used as either a scraper and wagon, or as a regular wagon under elevating graders, shovels, etc. It is constructed so that it scoops the load into a tight enclosure. After the load is obtained, the front extension apron covers over the cutting edge, transferring all the weight to the two pneumatic-tired wheels.

The RollClear Ripper—Cleaning Trash. The Standards Follow on Around So There Is No Chance to Pick Up the Trash.

The wagon scraper unloads just like a truck, and will deposit the material in a pile, windrow, or backfill against bridges or over embankments.

The "35" to "50" tractors have no difficulty in loading five or more yards in the Continental wagon scraper. The unit is light weight, weighing only 6575 lb., yet is ruggedly constructed. It is hydraulically operated and automatically adjusts itself to various dirt requirements.

The roll-clear ripper differs from other rippers in its method of lifting the standards backward when cleaning, etc. The standards make a complete circle before clearing the ground. This unit is also hydraulically operated. Like the wagon scraper, trailbuilder and bulldozer, the ripper is fabricated largely from Continental "dynamic steel," which is proving very popular in heavy tractor equipment.

▼

New Tractor and Trailer

A new rear dump trac-truk brought out by The Euclid Road Machinery Co., Cleveland, O., has an exceptionally short wheel base and in addition is equipped with two supplementary fast operated steering brakes.

The specifications include the following:

Engine—Six cylinder Model SRK Waukesha, 4⅝ in. bore x 5⅛ in. stroke, delivering 100 hp. at 1800 r.p.m. Electric starter and battery standard equipment.

Speeds—First speed is 3.1 miles per hour. Second, 6.0 miles per hour. Third, 9.8 miles per hour. Fourth, 13.5 miles per

New Euclid Trac-Truk

hour. Reverse speed is 2.5 miles per hour. (These speeds based on 12.00 x 24 tires with tracks.)

Capacity—Live load weight capacity is 20,000 lb. Body level content capacity is 6 cu. yd.

Dimensions and Weight—Wheel base is 10 ft. 10 in. Length over all is 20 ft. 4 in. Width over all 8 ft. Wheel spread center to center 6 ft. 6 in. Loading height 7 ft. Inside width of body at top 10 ft. 6 in. The net total weight is 15,000 lb. without tire tracks.

Body—An all-steel, one-piece body using 5/16 in. double plated bottom with 2 in. oak planking insert between bottom sections. Sides and ends are constructed of ¼ in. plates with heavy reinforcements of top and sides. Mounting is on coiled springs. A guard plate is mounted forward and extends over top of cab for protection in loading.

Frame—The frame is extra heavy, being constructed of 10 in. ship channels.

Axles and Wheels—Rear axle, equipped with ball bearings, is a heavy duty Euclid double reduction type with independent foot operated steering brakes for each wheel. Front axle is heavy duty truck type with wheels mounted on roller bearings.

New Power Wind-Up for Bottom Dump Crawler Wagons

A new power door wind-up attachment for bottom-dump crawler wagons has been put on the market by Trackson Co., Milwaukee, Wis.

The mechanism, which attaches to the front of the wagon, is self-contained and does not interfere with the rear end hand-winding device. It consists of a shaft carrying two narrow door

Trackson Wagon Wind

winding drums, a ratchet with a tripping arrangement, and a power-line drum, which is changeable to either end of the shaft.

Across the back of the tractor is attached a beam containing a long coil spring which connects with a bell crank, and this is also changeable to either end of the beam. A cable connects this crank with the end drum at the wagon. The trip rope extends from a trip lever to the tractor driver's seat.

The tractor driver simply pulls the trip rope to discharge the load. As the doors open the cable unwinds from the large drums and winds on the end drum. In other words, when the doors of the wagon are open the slack of the power-line is taken up at the end drum of the wagon.

▼

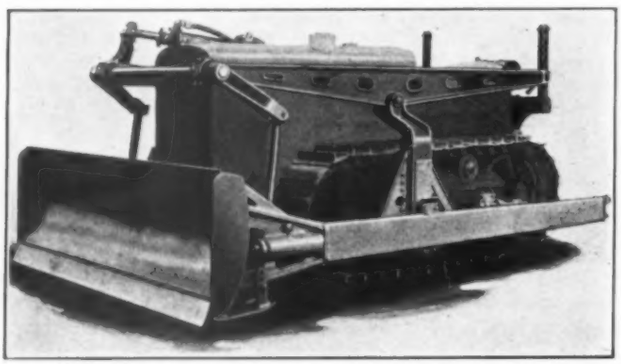
New Continental Bulldozer

A new heavy duty bulldozer announced by the Continental Roll & Steel Foundry Co., Industrial Equipment Division, 332 South Michigan Ave., Chicago, Ill., has a blade that can be tilted—either end up—so that dirt or other material that is being moved can be graded at the same time.

Tilting the blade is a simple matter. The tractor operator does this by changing the height of the rocker arms at their rear attachment. This he does in his normal position—always being convenient to the tractor and bulldozer controls.

The bulldozer pulls direct from the tractor drawbar. It has its own rectangular frame, ruggedly constructed, attaching to the tractor tracks through bulldozer rocker arm brackets and the drawbar. This construction prevents any stresses of bulldozing being transmitted to the tractor frame.

Dynamic steel is used almost exclusively in fabricating this heavy-duty bulldozer. This steel, a new metallurgical development, has unusual stamina and the ability to take unlimited hard impacts so common in heavy bulldozing work. Rocker arms, rocker brackets, rear frame and other parts are cast in one piece and then accurately machined.



Continental-Built Heavy-Duty Bulldozer

The blade is powered both up and down—or can be held in any position, whether a straight blade or tilted. This is controlled by a large capacity, hydraulic pump operated direct from the tractor power take-off.

The bulldozer can be converted into a Continental trailbuilder very readily. It is only necessary to secure the horn member and blade—all the rest of the machine is identical with the bulldozer.

Continental-Built heavy-duty bulldozers are manufactured by the Continental Roll & Steel Foundry Co., East Chicago, Ind., for Allis-Chalmers, Caterpiilar, Cletrac and McCormick-Deering crawler tractors.

▼

Power Shovels

New Truck Mounted Cranes and Shovels

The Universal Crane Co., Lorain, O., announced a new series of motor-truck mounted cranes and shovels.

These are known as the Universal-Lorain 40-37 and 30's, and have crane lifting capacities of 8½, 7¾, 7½, 6½ tons at 10 ft. radius. Crane booms are 25-30-35 ft. in length and may be equipped with straight boom tip extensions 5-10-15-20 ft. long to

New Truck Mounted Shovel in Operation

afford a maximum 55 ft. boom. Gooseneck extensions of 5-10 ft. are also available.

The shovel boom is a full shipper shaft type, rope crowd, of the same design as used on crawler machines. Dippers are furnished in ¾-½-⅜ yd. sizes.

The units are full revolving, one-man operated units powered by six cylinder gasoline engines. They are built to the Thew Center Drive principle, in which it is claimed that the unit is so balanced as to keep weight to a minimum, thus enabling the unit to lift 6½-8½ tons, with a total turntable weight suitable for mounting on 5-7½ ton motor trucks of standard makes.

▼

New 2-Yd. Convertible Shovel, Crane and Dragline

The Ohio Power Shovel Co., division of Lima Locomotive Works, Inc., Lima, O., builders of Lima shovels, draglines and cranes, has announced a new 2-yd. heavy duty shovel and 35-ton crane. This new machine is designated as the Type 801, and its design embodies features that are claimed to make possible low cost yardage. It can be furnished with gasoline, Diesel or electric power.

The compact design affords exceptionally short tail swing. Only one car is required for shipment. The boom is of box type construction, electrically welded throughout—no rivets or bolts are used in its construction. The chain crowd is independent of other motions. Drums have extra large diameters, which are responsible for the remarkable cable economy. The main machinery, including cone rollers, is equipped with roller bearings. This feature promotes frictionless action, assures perfect alignment of shafts and reduces upkeep expense. All gears are helical cut for smooth, quiet and long life operation. An electric starter within easy reach from the operator's position

Type 801 *2-Yd. Shovel*

is standard equipment. All major motions are independent —an important feature when the machine is used as a crane.

The Type 801 shovel can be easily and quickly converted in the field into a dragline or crane. When equipped as a dragline it will effectively handle a 3-yd. bucket.

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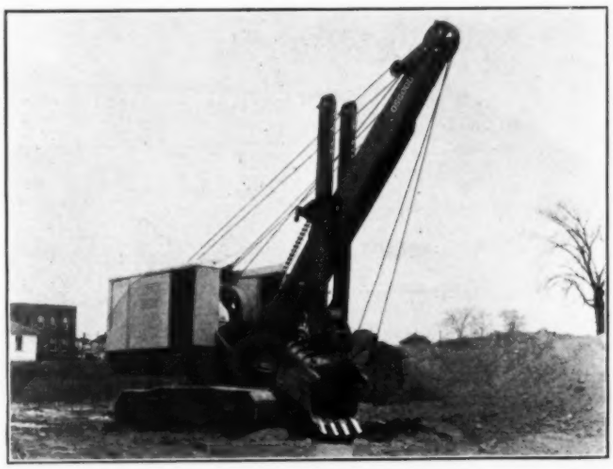
New Osgood 1¾-Yd. Shovel

As the result of a name contest which has been conducted during the past few weeks by The Osgood Co. of Marion, O., manufacturers of power excavating machinery, the name Osgood Chief has been selected for their new 1¾ cu. yd. size power excavator. The new Osgood Chief is designed for use as a shovel, dragline, clamshell, or crane; being readily converted in the field from one class of service to the other. As a shovel, it can be furnished with either the Osgood wire rope crowd of



The New Osgood 1¾*-yd. Shovel.*

the positive type, which has been in successful use for many years, or with the new Osgood independent chain crowd. In either case, the boom angle can be changed to suit the working conditions without adjustment of any kind other than the necessary raising or lowering of the boom by the power boom hoist. The boom is a single steel member, box section, with steel diaphragms and with foot castings of unusual size and strength. The dipper handle is of the outside type, with full length plates and bars filled with white oak, and securely through bolted.

The Osgood Chief has been designed for ease of operation and all levers and foot pedals are located to best possible advantage, the leverage being such that a minimum of physical effort is required. The main hoist and auxiliary clutches are set by power, and all operating levers toggle-in so that the operator does not have to expend his energy holding them in.

All of the operating machinery lies well back of the center line of rotation. All of the high speed machinery shafts are carried in anti-friction bearings and the low speed shafts in bronze bushings so constructed that they can be easily replaced if and when necessary. Shafting is all of vanadium steel alloy. Gears and pinions are all of steel of special analysis, best suited for the point at which they are used, and all on the upper body have teeth cut from solid blanks.

The Osgood Chief, like all other machines of the Osgood line, is available with either gasoline engine, diesel engine or single electric motor drive. Transmission from the power unit to the machinery proper is by means of a heavy, silent chain. On the Osgood Chief a new truck frame or crawler base gives the machine great stability and mobility. It is made up of one piece steel castings, titanium treated and thoroughly annealed. The rotating gear has machine cut teeth, is large in diameter and thoroughly and securely attached to the main body castings. The crawler treads or pads are of manganese steel alloy, joined one to the other with lugs having seven points of contact, and special alloy steel pins. Steering is under full control of the operator from his position at the levers in the cab. Protection for the operator and a full view of his work is afforded by glass windows in steel frames and the construction of the steel cab, which is cut back on the opposite side to afford clear vision.

Another unusual feature in the Osgood Chief is the fact that it has been designed so that almost any combination of line speed and line pull can be provided to suit the purchaser's particular needs. When used as a crane or dragline or clamshell unit, it is furnished with boom of required length to suit the purchaser's special need.

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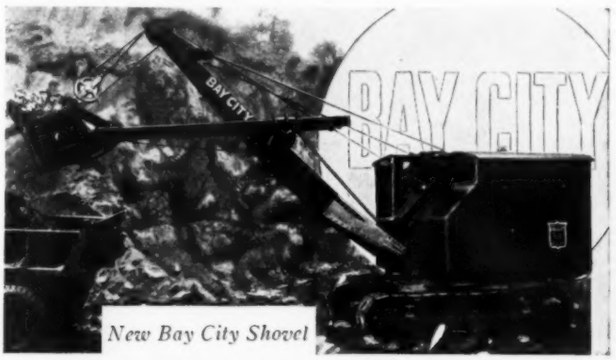
New Bay City Shovels

During the past year, Bay City model numbers, Bay City Shovels, Inc., Bay City, Mich., which had formerly been designated both alphabetically and numerically, were changed to a numerical basis, as a matter of uniformity. To new models, a



New Bay City Shovel

heavy-duty ½-yd. and a light ¾-yd. were added to the line. Improvements and refinements in the nature of increased number of frictionless roller bearings, the use of helical cut gears throughout, 6-cylinder gasoline power, optional diesel power for all full-revolving models and drop forged crawler shoes on ½-yd. models in addition to improvement in cab design were the important changes and improvements during 1934.

Strictly new models were Model 38, heavy-duty ½-yd., weighing 38,000 lb. equipped as shovel with drop forged crawler shoes, and Model 42 standard ¾-yd., with a shovel working weight of 42,000 lb. Both of the above machines being designed with frictionless bearings throughout, positive chain crowd and drive and all drum gears helical cut.

The complete present model designations for the Bay City line in addition to the ⅜-yd., three-quarter revolving tractor shovel and rubber tire mounted cranemobile are as follows: Model 30, standard ½-yd.; Model 27, heavy-duty ⅜-yd.; Model 38, heavy-duty ½-yd.; Model 42, standard ¾-yd.; Model 52, heavy-duty ¾-yd.; Model 62, heavy-duty 1-yd. Also Models 52S and 62S "Special" 1 and 1¼-yd. respectively.

New Koehring 2 Yd. Shovel

The new 801 2-yd. shovel has been announced by the Koehring Co., Milwaukee, Wis. This machine is convertible to either crane or dragline and is furnished with gasoline, diesel, oil or electric power. It has the independent and positive chain or cable crowd, and is equipped with a sturdy, high strength welded shovel boom. One of the most important features of this machine is the hydraulically cushioned clutch which is a clutch that sets firmly without shattering, is positive without constant adjustment, taking hold of the load with smoothness and ease, eliminating jerking of machinery and physical strain

New Koehring 801 *Shovel.*

of operator. It is the double band self-energizing power type with two bands of the same diameter. This type of clutch can be set with the machinery stationary which is an important advantage when setting steel or handling loads as a crane.

The primary or energizing band when engaged does not slip but carries its share of the driving load, reducing the work and wear of the secondary band instead of merely serving as an engaging member.

The 801 Shovel is equipped with an exclusive Koehring boom foot shock absorber which cushions and absorbs shocks received from sidewise pressure against the dipper.

A heavy cast steel gudgeon rotates in a bored gudgeon journal against spring compression either way.

The high "A" frame is raised or lowered for operation or traveling by power.

Other important features are the Koehring all steel full length multiplanes which have no mud pockets or gravel traps, the accident-proof traction lock, independent drums independently operated and mounted on independent shafts, raising and lowering the boom by friction clutch control by means of a simple lever shift.

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New Clutch Control for Power Excavators

An entirely new application of a well known force has been brought out by The Osgood Company of Marion, O., and successfully applied to the operation of its various size power excavators. In this application, vacuum created by the engine is employed to actuate the swinging clutches. Vacuum is taken from the engine and led to the operator's position where it is controlled by an extremely simple and highly efficient and durable valve, which valve, requiring no more pressure than can easily be exerted by the touch of one finger, directly, surely, positively and efficiently controls all the swinging and traveling motions.

A flexible line is led from the manifold on the engine, to a reservoir conveniently located, which reservoir stores up enough vacuum so that the clutches can each be operated several times, so there is always energy at hand for use during all periods of the cycles of operation.

This energy derived from the engine and controlled as before mentioned by the operator is applied to the clutches through the medium of an arm which is connected to a chamber which chamber instantly and efficiently operates the clutch whenever the power is applied to it through the control valve previously spoken of.

Only one valve is used and only one lever is necessary to operate this valve. It is of the two way type and a movement forward of the short lever operating the valve instantly swings the machine to the right and a similar movement of the short control valve in the opposite direction instantly swings the machine to the left. The length of travel of this short control valve does not exceed 3 inches.

Roughly, the operator only needs to exert not over 2 lb. pressure as against a former necessary pressure of many times more. The traveling clutches are operated in the same manner by this same force.

This operating control device can be put on any Osgood in the field and is available on all new Osgood machines. The vacuum used to operate the chambers which in turn control the clutches, is but a tiny part of that created by the engine and its use in no respect whatsoever impairs or detracts from the efficiency of the prime mover.

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New Shovels

The New Model General of the General Excavator Co., Marion, O., in ½ and ⅝ yd. sizes, and its running mate the Invincible in ⅝ and ¾ yd. sizes are now available either with General's patented rope crowd shovel boom assembly, which has been so successfully used on hundreds of preceeding Generals, or with chain crowd shovel boom assembly. Boom assemblies for trench or pull shovel, skimmer, clam-shell, dragline, pile driving, magnet and all crane work are available. To change the boom assembly from one type of work to another, it is not necessary to change anything within the cab; just change the boom and rereeve the ropes.

The shovel boom whether for rope or chain crowd is of all

The Invincible

steel construction, 18 ft. long between centers for the chain crowd, and 19 ft. 7 in. long between centers for the rope crowd. The handle is of the outside stick type; the stick of composite oak and steel construction. The handle is 14 ft. long.

The position of the lugs on the deck casting for hinging the boom, the location of the shipper shaft on the boom, the use of the outside sticks, etc., give these machines a remarkable operating range.

When the chain crowd is used, the deck machinery unit is placed immediately ahead of the shaft carrying the swinging clutches. This unit includes two outside band type clutches actuated by General's Easytouch mechanism, and a large band type brake. The ratios are proportioned to give a powerful crowd and a speedy retract. With this arrangement the operator can vigorously shake the bucket.

New lines are found in the cab. The roof and the rear end are now curved, and the roof is aluminum-painted, which by reflecting the sun's rays keeps the inside of the cab cooler. The radiator fan may be of the push or pull type, which enables the

operator to further control the temperature within the cab.

A portion of the counterweight is bolted to the rear end of the machine. When operating conditions warrant the use of a lighter weight machine this counterweight casting may be removed. The fact that all machinery is set back of the center pin allows these machines to handle exceptionally large loads when being used as a crane.

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New Lima 1¾-Yd. Shovel

A new 1¾-yd. shovel, dragline and crane was announced by The Ohio Power Shovel Company, Lima, O. This new machine has been designated as the Type 701.

It is powered by a 6-cylinder gasoline engine. Provision is made, however, for installing Diesel or electric power units when desired. Special attention has been given to the selection of materials. Every shaft, etc., is made of a steel specially formulated for its particular use. Noisy spur gears are discarded for the quiet long-lived helical cut type. Friction is practically eliminated by the use of roller bearings at every vital bearing point.

Other advantages found in the Type 701 consist of square lever shafts which eliminate troublesome keys. Shafts on which are mounted sliding members are splined for accuracy in fit and elimination of backlash. Cable life is greatly lengthened by the use of drums with exceptionally large diameters. Each drum is of sufficient diameter to accommodate extra long cables without double wrapping.

Synchro-power clutches insure ease of operation by responding smoothly to the slightest motion of the control levers. All major motions are independent, therefore making it possible to hoist, travel, swing, steer, and raise or lower the boom simultaneously.

The boom and dipper handle are of box construction which insures great strength and durability. The manganese dipper is cast in one piece with detachable lip. The crawler truck is the open roller type with provisions made for applying extensions in the field whenever greater bearing surface is required. The machine is easily and quickly converted into various combinations by simply changing front end equipment.

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New Dipper Trip and Tag Line Winder

A new dipper and tag line winder for power shovels has been announced by The Morin Mfg. Co., Holyoke, Mass. This new Type H has the following improvements:

Larger rear bearing, bronze bushing in front and rear bearing with a large grease reservoir around the bushing, new type of thrust cap which completely encloses the end of the shaft and keeps lubrication in and dirt and grit out. The thrust cap is provided with a hardened steel thrust bushing and thrust screw. All thrust on this dipper trip is taken care of with ball thrust bearings. The drum is provided with an Oilite bushing with large oil reservoir around the bushing and felt oil retainer. This dipper trip is also constructed so that it is impossible for any oil to get in the friction disc. The hub on the friction disc extends into the end of the drum. This hub is provided with oil throwing off edge which will throw off any oil which may leak out of the drum bushing. The friction disc is provided with 36 large radiating fins which keep the discs comparatively cool when the machine is used for tag line winding.

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New Bucyrus-Erie Excavators

The following new machines were announced during the year of 1934:

New ⅜-Yd. Excavator. Early in the year announcement was made of a modern ⅜-yd. shovel having unusual speed and many new features. Like all Bucyrus-Erie contractor shovels, the machine is completely convertible. It is available as shovel, dragline, clamshell, lifting crane, drag-shovel, skimmer scoop, backfiller or piledriver.

New 1¼-Yd. Convertible Machine. Another machine announced by this Company during the past year was the 34-B, a yard-and-a-quarter machine of extremely modern design, driven by gasoline, Diesel or electric power and completely convertible to the various forms used by contractors.

New 14 to 22-Yard Electric Stripper. A machine of unusual size and capacity is the new 950-B. It is capable of producing very high yardages in deep overburden, weighs 2,400,000 lbs., is convertible for use as either shovel or dragline and has many new features to increase its output and lower the cost of operation.

New 8 to 14-Cubic Yard Electric Stripper. The 550-B recently announced is very similar and has all the operating features found on the 950-B described immediately above.

New 120-B Quarry and Mining Shovel-Dragline. This 4-yard machine has all the operating advantages found in the earlier 120-B shovel. It is readily converted in the field for use as either shovel or dragline and is even faster and more powerful than the earlier machine.

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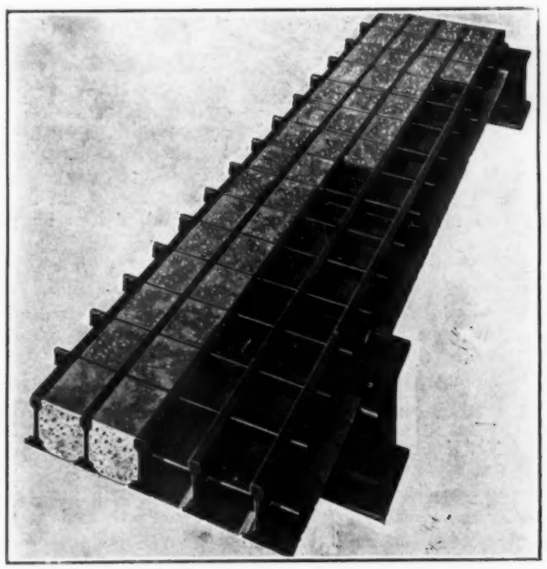
Miscellaneous

Armored Roadway Slabs, for Bridges

A combination steel and concrete bridge roadway slab, which takes advantage of the I-beam principle was placed on the market by the Carnegie Steel Co., Carnegie Bldg., Pittsburgh, Pa. The construction is a series of alternating I-beams and concrete ribs thoroughly tied and locked together by an adequate number of notched cross bars near both the top and bottom surfaces of the slab, providing sufficient reinforcement for lateral distribution of loads; and in addition, the top bars form a part of the integrally armored surface. Metal form strips, closely fitted between the lower flanges of the I-beams, provide a tight form work for the concrete. These strips are omitted over the top flanges of supporting beams or girders, permitting the concrete to come directly in contact with the bearing areas. The gap in



I-Beam-Lock Armored Bridge Roadway Slab.

the form strips over the supports, and the open space between the I-beams, facilitate the welding of the I-beams to stringer flanges. Only the webs of the I-beams are punched or pierced for the insertion of the cross bars. Both the top and bottom flanges of the I-beams are intact throughout their entire length. The slab is so designed as to have constant moment of inertia for resisting both positive and negative bending moment stresses. The notched cross bars are first inserted flat in the L-shaped web

holes, then turned through an arc of 90 degrees, and tack-welded in their final position. These bars hold and lock the I's rigidly at uniformly spaced intervals.

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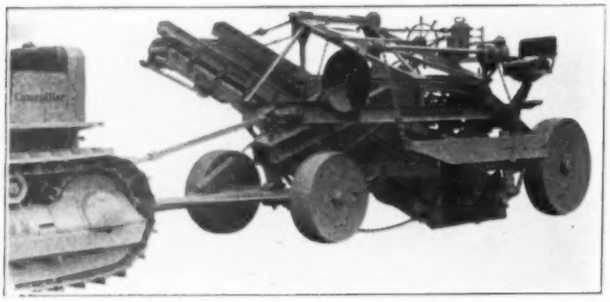
New Power Take-Off, Power Controlled Elevating Grader

A new power take-off, power controlled elevating grader was announced by Caterpillar Tractor Co., Peoria, Ill. The new model features power operated controls; a 48-in., shaft-driven carrier; wide drum-type wheels; extensible axles, enclosed gear drives; and wheels, drive shafts, drums and belt rollers mounted on ball or roller bearings. Power is supplied to the carrier, operating controls and improved pan cleaner by a rear power take-off on the tractor.



Caterpillar Elevating Grader with Power Take-Off Drive and Full Power Control.

From his comfortable seat directly over the plow, the operator has an unobstructed view of the furrow, the belt, the wagons and the tractor driver. Every working adjustment of both plow and carrier is made by a touch of the hand on the four power control levers grouped within easy reach.

This new elevating grader is designed especially for the "Caterpillar" Diesel Seventy-Five Tractor, but it may also be used with the Seventy, the Diesel or gasoline Fifty, or the Sixties. These new machines may be equipped with 19, 22, or 25-ft. carriers, and when so equipped have shipping weights of 17,300 17,840, and 18,340 lbs., respectively.

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New Concrete Vibrator

Rapid extension in State specifications requiring vibration of concrete during pouring has led the Superior Construction Equipment Co. of Indiana, Inc., to introduce two new models of concrete vibrating machines.

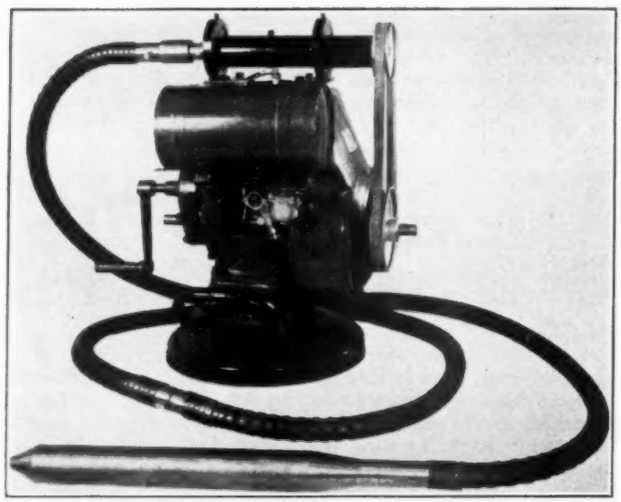
The two new concrete vibrators are both driven by gasoline engines but electric motors may be furnished if desired. The new Model M-1, illustrated, is provided with a 2 H.P. Lauson engine, mounted on free swiveling base, with 2⅜-in. diameter vibrator. The Model M-2 has a 4 H.P. Lauson engine and wheelbarrow mounting with 12-in. by 3.50 single pneumatic tire, and 3½-in. diameter vibrator.

Both vibrators are self-contained, fully enclosed, and give from 3,800 to 4,000 pulsations per minute. The rotors are carried by ball bearings and driver from the engine by flexible steel shafts, encased in moulded rubber hose with internal spiral steel bearing and full external steel armor.

Several new and improved features are stated to be embodied in these machines. The engines are operated at much reduced speed to insure longer life and lower maintenance cost. The high vibration rate is obtained through a V-belt speed step-up and ball bearing belt-adjusting counter shaft. Heavier engines are employed, with increased power obtained from larger bore and stroke instead of by excessive motor rotation. Crank shafts have Timken roller bearings.

Full releasing Twin Disc clutches are regular equipment on Model M-2 and optional on Model M-1. The engines may be throttled down for grinding and adapters used for grinder spindles, circular saws and other portable tools.

Another important feature is the type of couplings furnished on both driving shafts and outer casings. All couplings are threaded, there being no slip joints at any point. This provides positive connection in both units. These machines are regularly



Model M-1 Concrete Vibrator

supplied with 14-ft. flexible drive but additional sections may be inserted to give a total of 21 or 28 ft.

An important item in design of these units is the fact that vibrator itself is now separable from the flexible drive. Should replacement of vibrator parts or the drive section attached to it be required, it is not necessary to replace the total assembly.

These vibrators will be nationally distributed by the Superior Construction Equipment Co. of Indiana, Inc., with executive offices at 1836-60 S. Kostner Ave., Chicago, Ill. They will be marketed through regularly established local equipment dealers on an exclusive territorial basis.

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New Heavy Duty Trailer

The C. R. Jahn Co., 760 Polk St., Chicago, General Distributors for the LaCrosse Tu-Way Trailer announces a new heavy duty design.

This new model is of the conventional "Gooseneck" type but incorporates new and advanced features of design and construction.

The significant feature lies in the manner of main beam construction. This beam actually runs clear through from rear end to front end. The "Gooseneck" is secured by cutting one flange bending and taking a triangular piece out of the web and welding it back together again. Thus the beam is never cut through but retains is original strength.

Either pneumatic or solid tires can be had and braking is provided on all four rear wheels, either mechanically, vacuum or air controlled.

When mounted on pneumatic tires the new heavy duty small diameter tire developed by the Goodyear Company is used. These tires are less than 30 in. in diameter materially lowering the platform height over the usual conventional design of this type.

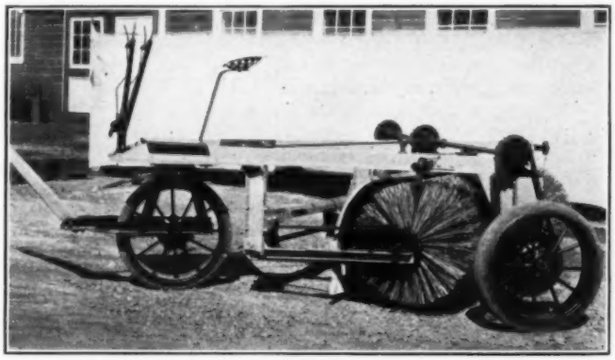
The C. R. Jahn Co. recently announced a Tu-Way design mounted on these tires. This design gave all the Tu-Way advantages—steered from either end, pulled from either end and had braking on all wheels controlled from either end. Mounted on the new type small diameter tires it provides a deck that can be loaded from either end and is only 30 in. above the ground. The new type tire materially reduces costs and provides a pneumatic tired trailer for very little more than the cost of solid tired equipment.

New Heavy Duty Trailer.

New Street Sweeper

A new rubber tired street sweeper mounted on a 3-wheel chassis was placed on the market by the Universal Road Machinery Co., Kingston, N. Y. In this machine a new method is used for raising and lowering the broom, with cables operating through sheaves, providing quick, easy and positive control.

The broom is mounted diagonally across the frame at the point usually occupied by the rear axle, instead of back of the axle,



New 3-Wheel Rubber Tired Street Sweeper

so that no counterweight is required. The frame is of an all steel construction, of great strength and durability, but because of the special design is considerably lighter. The broom is engaged or disconnected as desired, through a jaw type clutch, and the control levers for clutch and broom raising device are within easy reach of the operator. The clutch is held firmly in position when operating the broom, by a heavy coil spring provided for this purpose.

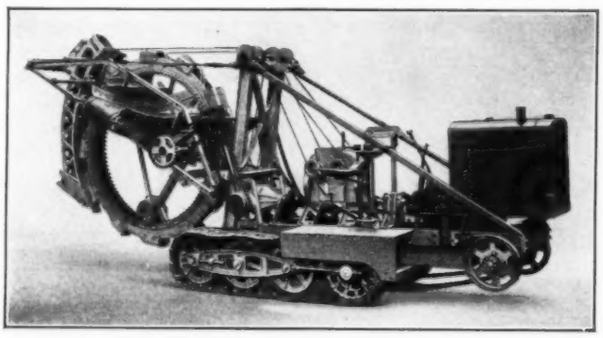
▼

New Small Ditcher

The Buckeye Traction Ditcher Co., Findlay, O., has recently added a new model to its line of ditching and trenching machines. The new Model 11 is the smallest of the Buckeye line —a service ditcher built for speedy, nimble operation in cramped quarters, down alleys, across lawns, close to curbs—anywhere that laterals or other small trench up to 22 in. in width and 5½ ft. deep need be dug.

Overall width of the machine is only 52 in. It is mounted on full length Alligator traction units of the latest Buckeye design and may be turned completely around in its own length.

As in other Buckeye wheel type machines, the most important feature of the Model 11 is the rotary digging wheel.



New Model 11 *Buckeye Ditcher.*

In the new Model 11, it is claimed, the rugged strength and smooth operation of the digging wheel permits its operation at speeds that produce remarkable footage records. It is stated that when soil conditions are favorable, the smaller sizes of shallow trench may be dug at speeds up to 27 ft. per minute. Through two selective four speed transmissions, 16 different gear ratios are instantly available. Further regulation of speed through the manually operated engine governor give an almost unlimited number of digging speeds ranging from 8 in. per minute on up. At the slower digging speeds, the Model 11 cuts its way easily through the most difficult of soils. Nothing short of solid rock stops its progress.

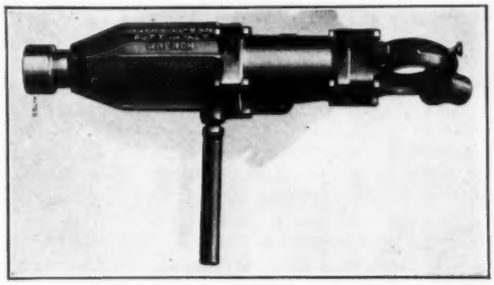
The Model 11 is available in three different bucket widths, cutting trench 11½ in. to 14½ in., 14½ in. to 18 in., and 18 in. to 22 in. Buckets may be furnished for either rounding or square bottom ditch. The crumber and leveler at the rear of the cutting wheel assures a clean trench.

▼

A New Pneumatic Tool—the I-R Pott Impact Wrench

Imagine a small machine weighing about 20 lb. that will spin down a 1-in. or larger nut at 700 rpm. and then give it a series of smart torsional blows at the rate of 1400 a minute to tighten it as securely as desired! That is just what this newest pneumatic tool does.

In the Ingersoll-Rand pott impact wrench a principle entirely new to the pneumatic tool field is brought into play—that of the rubber "accumulator." This is a cylindrical block of special rubber interposed between the "multi-vane" air motor and the chuck. In operation, the torque from the motor is applied to the accumulator which, in twisting, becomes shortened, lifting the "hammer" from engagement with the "anvil." The hammer is then released and is spun forward to the next engagement, thus delivering a powerful blow, with considerable mass behind it, to the anvil, on the end of which the chuck is attached.



The I-R Pott Impact Wrench.

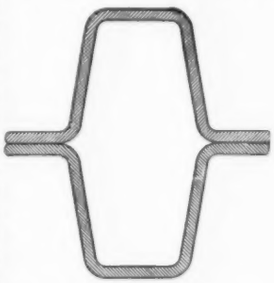
These torsional impacts occurring at the rate of 1200 to 1400 blows a minute exert a more powerful turning effect than is possible with any other portable wrench. This type of turning action, new to a power wrench, makes it possible to remove nuts which could not be taken off except by splitting with a chisel or burning with a torch.

One man operates this wrench with ease. The accumulator absorbs the torque and eliminates the danger of shock or injury to the operator. The cushioned action makes it possible to operate the impact wrench on high places or in positions that would be unsafe with any other type of machine.

▼

Steel Post for Highway Signs

A new steel post for highway signs was brought out by the Behtlehem Steel Co., Bethlehem, Pa. This is of double section construction and is intended for use where exceptional strength is required, as for the mounting of large signs at a clear height considerably above the average. The double channel post is formed by placing two posts face to face and securely welding the flanges. The posts are rolled from rail steel to a wide flange channel section. Bethlehem highway sign posts are punched with any number of holes, as requested; if not otherwise specified holes are punched ⅜ in. in diameter, 1 in. center to center. The posts are pointed to facilitate driving and are equipped with anchor plates when so specified.



Double Section Sign Post

New Snow Plow Development

A development of great interest to highway officials and other users of snow plows is the Blackhawk hydraulic "lightning blade-lift," a product of the Blackhawk Mfg. Co., Dept. RS 7, 120 North Broadway, Milwaukee, Wis.

It consists of a reservoir and twin pumps which are located in the cab so that the handle of the pump is within easy reach of

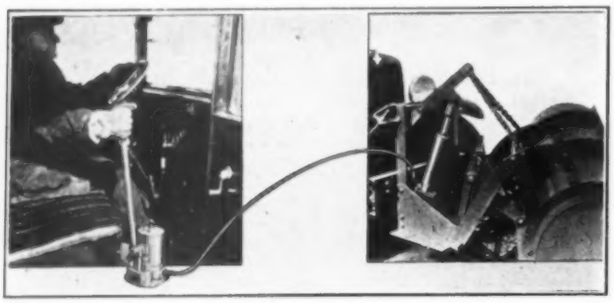


Illustration Showing How Blackhawk Hydraulic Blade-Lift Is Operated

the driver's hand. From the illustration, it is apparent that as the operator pumps the cab unit, he forces the oil through the high pressure flexible hose to the ram out in front, thus raising the plow.

To lower, the operator simply opens the release valve, located on the top of the control unit, thus allowing the oil to return to the reservoir.

Incidentally, the drop of the blade is instantaneous or controlled at will by the operator.

According to the manufacturer, the Blackhawk "lightning blade-lift" offers three distinct advantages over the mechanical winch type of hoist: easy operation, warm cab comfort, and low maintenance cost.

The installation is simple and economical enough so that old plows can be changed over to this up-to-date hydraulic control.

▼

Improvements in Finishing Machines

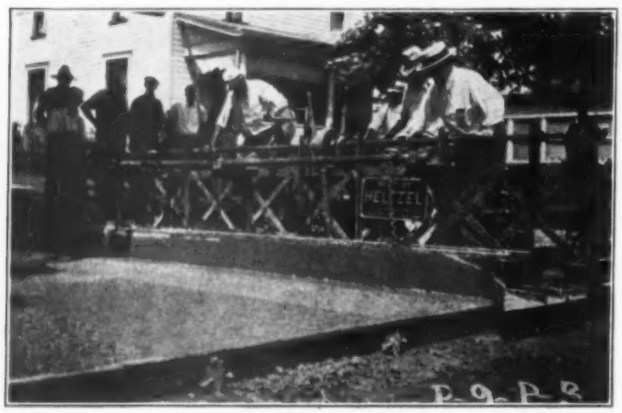
Among the improvements introduced during the past year by the Flexible Road Joint Machine Co., Warren, O., were the following:

Forward and backward screeding; a screed 18 to 20 in. wide; an adjustable 40 to 50 ft. finishing machine.

With reference to forward and backward screeding. When screeding backward, the screed carries enough material to fill scored spots; the screed is lifted at intervals and leaves the excess material in windrows across the road, which is again carried forward when direction of machine is reversed.

Another improvement is a 3 to 4-ft. finishing machine—complete in every detail—made for an Ohio contractor who used it with excellent results.

Screed starting springs: These springs store pressure while the screed is reciprocating, to enable them to start the screed independently of the engine—thus causing machine to work smoothly. The engine is not called upon for extra power in starting the alternating or reverse motion of the reciprocating screed.

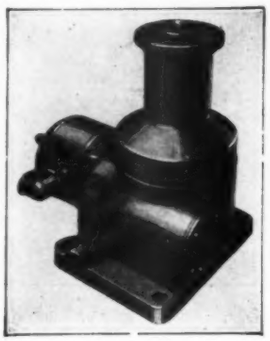


Backward and Forward Screeding Machine in Operation.

▼

Link-Belt Motorized Car Spotter Announced

In line with the trend of the times to design machinery more compactly, Link-Belt Co., Chicago, announced that its vertical Capstan Electric Car Spotter will hereafter be furnished "motorized," meaning that the motor will be attached direct to side of spotter housing, with the result that no motor shaft coupling or separate motor base plate will be required. With motor bolted to side of spotter housing, proper initial and permanent alignment of motor shaft is assured; and the plan measurements of foundation required are a minimum.



Link-Belt Motorized Car Spotter

The motor shaft extends into a substantial one-piece housing which contains all gears—a helical-gear reduction at motor, and a worm-gear set. The gears run in oil, and are readily accessible. The motor is of high-torque fully enclosed type, and can be removed as a unit complete with motor pinion, without disturbing the rest of the machine. The capstan is machine finished to prolong the life of the car haulage rope.

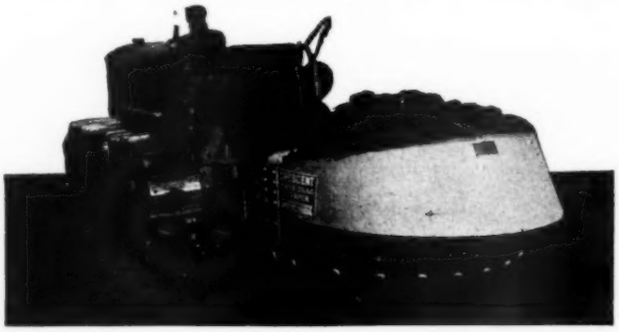
The Link-Belt Motorized Spotter, like its predecessor, is available in two sizes. The smaller machine has a rope pull of 5,000 lb., and the larger size, 10,000 lb. An eight-page illustrated book No. 1392 covers this new product and will be sent to anyone requesting a copy of it on business letterhead.

▼

New Scraper Has Unique Form of Hydraulic Control

The Crescent hydraulic scraper, placed on the market last year by Sauerman Bros., Inc., 488 S. Clinton St., Chicago, features a unique form of hydraulic control which is claimed to be an improvement over previous schemes for hydraulic operation of a scraper with a tractor, and in particular is said to increase greatly the effectveness of the scraper in penetrating hard earth materials.

The Sauerman hydraulic control provides a "crowding" action for digging, in addition to the usual dumping and holding operations of the normal hydraulic scraper. The "crowding" action



Crescent Hydraulic Scraper on a Grading Job.

requires a double acting ram and a control valve with a single operating lever having five operating positions instead of the usual three which are provided on the ordinary double acting valve. Not being able to find a hydraulic valve on the market having these five operating positions, Sauerman engineers designed a suitable valve, and this feature has since been added to standard commercial valves, as the additional operating positions are of advantage in several types of hydraulic equipment.

The central, or neutral, position permits the oil to be freely circulated by the pump and the ram to be freely moved by the

weight of the scraper. Moving the lever in one direction contracts the ram, and, in the other direction, expands the ram, the first motion being used to dump the bucket and the second to "crowd" the digging action. The two "outside" positions are holding positions, which prevent travel of the ram in either direction, and, at the same time, permit free circulation of the oil by the pump.

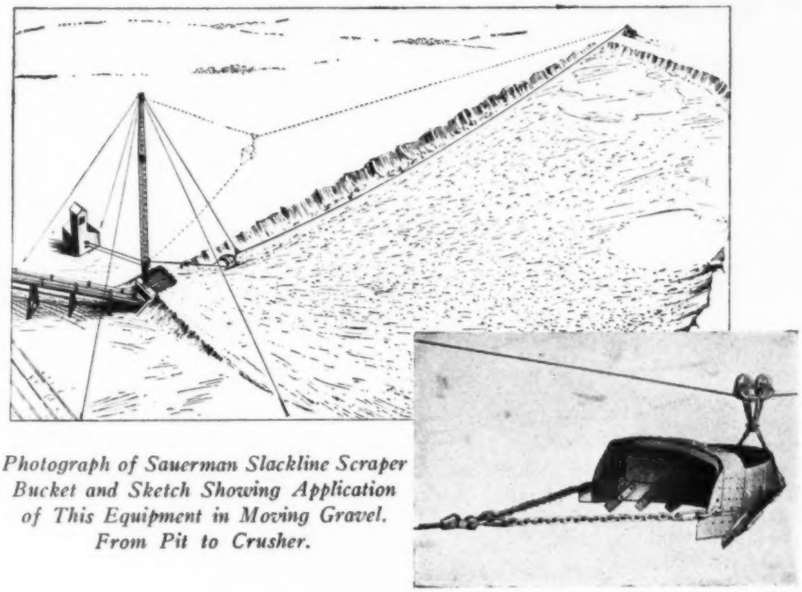
Because of the elliptical form of the cutting edge of a Crescent scraper, the "crowding" action raises the forward part of the cutting edge, with the result that the pull of the tractor is concentrated on a narrow portion at the back of the scraper, thereby facilitating the penetration of clay, hard-packed gravel, etc. Application has been made for patents covering these features.

▼

Slackline Scraper Bucket

The Sauerman slackline scraper excavator, the latest addition to the group of long range excavators manufactured by Sauerman Bros., Inc., 488 South Clinton St., Chicago, is a low-cost unit for moving earth and bulk materials distances from 200 to 1,500 ft.

As its name implies, this new machine is a combination of two familiar types of excavators—the power drag scraper and the slackline cableway.



Photograph of Sauerman Slackline Scraper Bucket and Sketch Showing Application of This Equipment in Moving Gravel. From Pit to Crusher.

The bucket furnished with the Sauerman slackline scraper excavator is the well known Crescent scraper. The scraper bucket is attached to a carrier which rides on a track cable. The method of operation resembles that of the standard drag scraper as far as digging and conveying is concerned, but in the dumping operation the bucket is lifted into the air by tightening the track cable, and the force of gravity is utilized to carry the empty bucket back to the digging point. This speeds up the operating cycle and is claimed to result in a larger hourly handling capacity than is attainable with an ordinary scraper insallation where the bucket is dragged back over the ground.

When used in the production of gravel, the Sauerman slackline scraper is operated from a stationary mast. For stripping overburden, digging canals, building levees, and similar work, the machine is operated between a traveling head tower, from 80 to 130 ft. in height, and a low tail tower. It is stated a maximum hourly capacity of 600 cu. yd. can be attained with the largest of these machines.

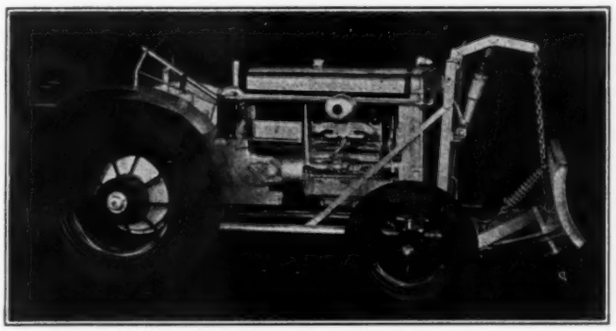
▼

New Snow Plow

A new snow plow that pushes the snow from the rear axle of the tractor instead of from the front end only has been brought out by the Fate-Root-Heath Co., Plymouth, O. Heavy high carbon steel push bars extend back under the tractor and connect as near the point of power as possible.

Other important features claimed for the plow are:

When in operation, the snow plow rides on adjustable chilled shoes, thus enabling the blade to be set at any desired distance from the pavement.



Silver King Snow Plow

The blade can be set at any desired angle and can quickly be reversed to throw the snow to either the right or left.

A simple tripping device consisting of one heavy compression spring can be adjusted so as to allow the blade to pass over obstructions without damage.

To gain maximum strength, the frame and push bars of the Silver King snow plow are constructed of high carbon steel while the blade is of special steel reinforced with six perpendicular ribs and a horizontal heavy steel angle running across the bottom of the blade.

The cutting blade is made of special steel and, being reversible, gives double service.

All controls are hydraulic and are operated from the seat of the tractor.

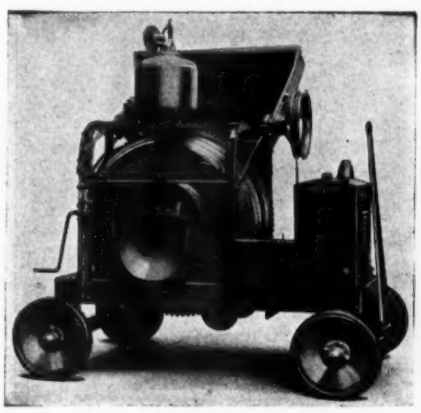
▼

New Koehring Mixer

A new 2-bag mixer was added to the line of the Koehring Co., N. 30th St. and W. Concordia Ave., Milwaukee, Wis. The special features of this mixer include the following:

Full floating—on springs; frame only 88⅞ in. long; only 3,800 lb.—approximate weight; equipped with anti-friction bearings; roomy skip with skip shaker; automotive type steering; accurate syphon type water tank; self cleaning water tank; fast and clean charging and discharging; axle stabilizers.

The free rolling drum is supported on beveled edge 10-in. rollers, solidly fastened to shafts turning in self-aligning, double row ball bearings.



Koehring 10-S Dandie Mixer

Both steel tired and rubber tired wheels are equipped with full length roller bearings. The driving shaft is mounted on double-row, self-aligning ball bearings. Ball bearings are used in the gear reduction case. All of these bearings are adequately lubricated by a new type high pressure lubricating system.

Both steel tired and rubber tired wheels are equipped with full length roller bearings. The driving shaft is mounted on double-row, self-aligning ball bearings. Ball bearings are used in the gear reduction case. All of these bearings are adequately lubricated by a new type high pressure lubricating system.

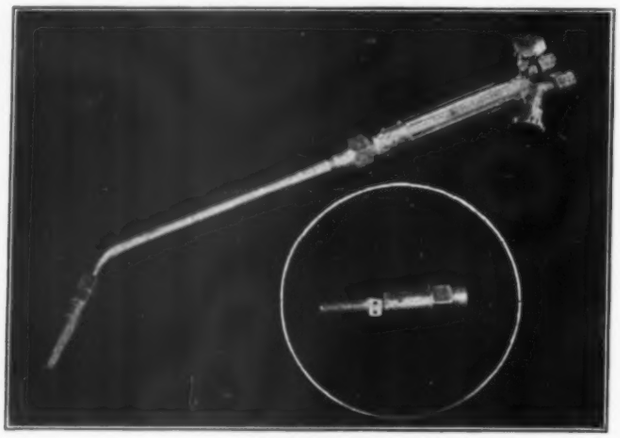
All operations have been made simple and effortless. The operator can control all operations, as one man end control permits him to see both sides of the mixer. Charging, mixing or discharging efficiently handled from the drum-end of the machine.

▼

New Blowpipe Head

The Linde Air Products Co., 30 East 42nd St., New York, N. Y., announced a new welding head, known as the Multi-Flame Lindewelding Head, for use on W-17 or W-22 Oxweld blow-pipes.

The Multi-Flame Lindewelding Head consists of a special



The New Multi-Flame Lindewelding Head

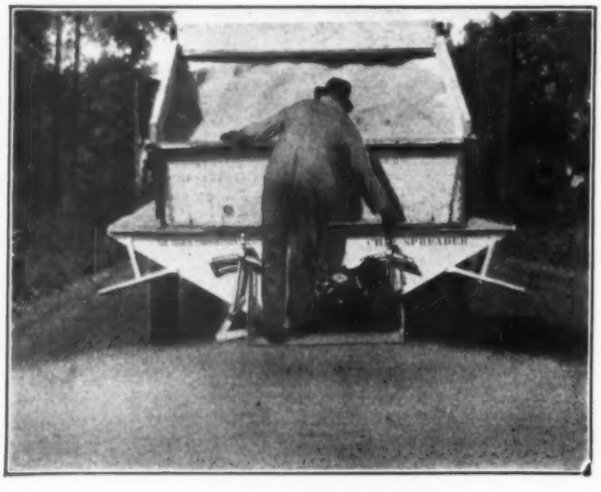
chromium-plated stem and tip, available in three sizes, their use depending upon the pipe size. Its radical departure from other blow-pipe heads is the design of the tip to give three flames: a main welding flame and two smaller auxiliary flames, the latter so positioned as to preheat both edges of the vee ahead of the point of welding.

Savings of more than 25 per cent in rod and gases and 33⅓ per cent or better in welding time are claimed to be possible with the new head employing the special manipulative technique recommended for its use.

▼

New Material Spreader

A new material spreader has been introduced by the Burch Corporation of Crestline, O., which is designed for fast, accurate spreading of chips, gravel, sand, cinders and similar materials It makes use of the well-proven principle of spreading by means of a spinning disk that throws the material by centrifugal force. It is simple in operation and ruggedly built for long years of trouble-free service. Two features are of particular interest.



New Burch Matreial Spreader.

The first of these is the ease with which the spreader is attached to a truck. When the load has been spread, unhooking the spreader and attaching to the next loaded truck takes but a couple of minutes as the spreader is suspended simply by two chains that hook to the truck body or chassis, and by a cable that hooks over the tail gate.

The second feature of the spreader is the uniform speed of the spinner disk. This disk is driven by a small motor and its speed is altogether independent of the speed of the truck. The motor can be set for the desired speed and will remain constant, thus giving uniform distribution of the material. The spinner disk is started or stopped instantly by a means of a belt tightener on the belt drive from the motor to the spinner drive shaft.

▼

New Toro Mower

A new general purpose rough mower named the Roadmaster has been introduced by the Toro Manufacturing Co. of Minneapolis. It is their standard Master Tractor equipped with rubber-tired wheels and sickle bar attachment. The main advantage of

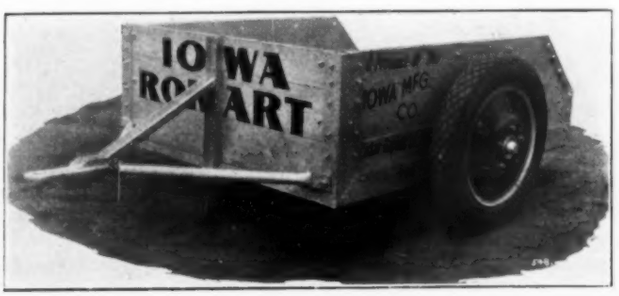
The Roadmaster.

this new mower is that the sickle bar can be quickly removed and gang mowers substituted, or the tractor can be used alone for general utility work. It has a speed range up to 15 miles per hour and is stated to be well adapted for use on golf courses, municipal park systems, airports, highways or other general rough mowing.

▼

Cart for Hand Labor Quarry Operations

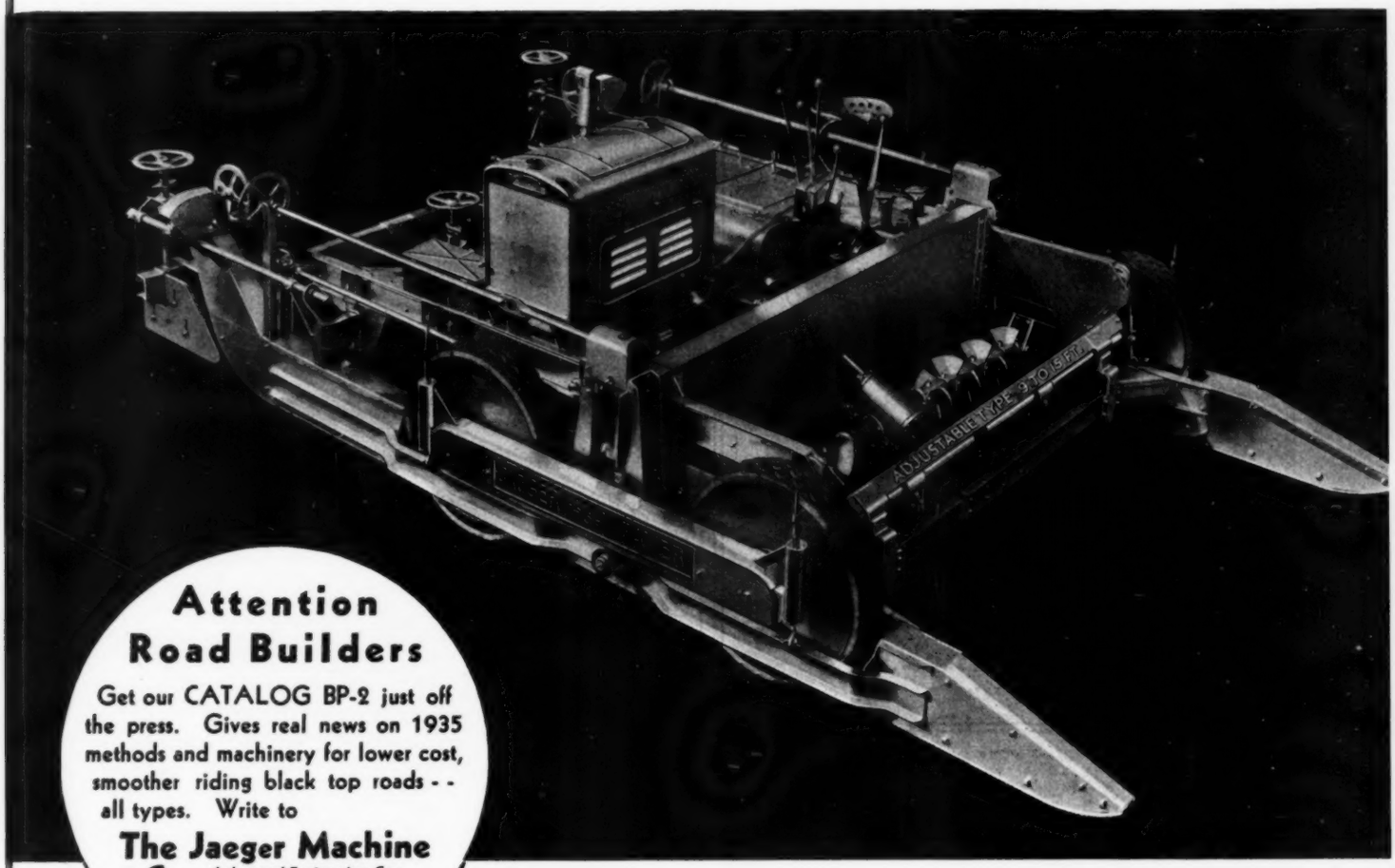
A quarry cart designed to meet the NRA program for use of hand labor and do so on an economical basis was brought out by the Iowa Manufacturing Co., Cedar Rapids, Ia. This cart



The Iowa Rokart

has a capacity of 2 cu. yd., is steel lined and reinforced with steel members throughout to eliminate wear. Wheels, rims and spindles are heavy duty truck equipment and the tires are 8 ply. The platform of the cart is 11 in. above the ground.

PAVER, Adjustable 9′ to 15′ — Forms . . . 400 to 1000 Tons a Day



Attention Road Builders

Get our CATALOG BP-2 just off the press. Gives real news on 1935 methods and machinery for lower cost, smoother riding black top roads - - all types. Write to

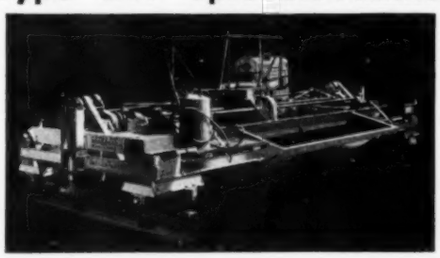
The Jaeger Machine Co. (Lakewood Engineering Co. a Subsidiary)
223 Dublin Avenue
Columbus, Ohio

well prepared subgrade. There is no weight or traction on the newly laid material.

These are just a few high spots of this machine which is backed by 3 years of actual field tests and the longest experience in spreading and finishing equipment of any company in America. Send for new CATALOG BP-2 giving complete data on Jaeger-Lakewood 1935 equipment for all types of black top roads.

FOR ALL TYPE OF BITUMINOUS ROADS!

Type "DX" Spreader-Finisher



Powerful 20′ machine, "re"-mixes and spreads as well as finishes the black top. Meets the demand for a bigger production machine (up to 1500 tons daily) to operate on forms or cu b—produces finest, smoothest riding roads ever laid.

Robinson & Cooper, near Dayton, O., with 4-man crew, 107 degrees roadside temperature and 50 per cent of time spent waiting for trucks, ran 105 tons per hour. Brown & Root, Houston, Texas, are breaking records. Get the details.

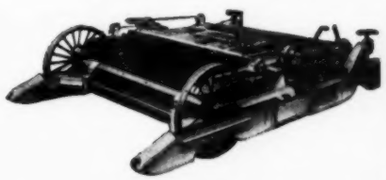
ASK ABOUT OUR SUBGRADERS FOR LOW COST, ACCURATE SUBGRADING!

1935 Type "D" Finisher

Used throughout the world for concrete and higher type bituminous and concrete roads and streets, either hot or cold mixed—gives new smoothness of surface at lower costs. Inexpensive attachments make it suitable for wedge course, binder and top, either full widths to 30 ft. or half widths—10,000 sq. yds. per day on 20-ft. road. Valuable new features developed by Jaeger black top engineers such as special Asphalt Dolly replacing compression strips and extra workers—no rakers needed in front. Send for CATALOG BP-2.

ASK ABOUT OUR PORTABLE "SURE PRIME" PUMPS FOR WASHING OUT ASPHALT CARS!

JAEGER VIBRO
BLACK TOP SPREADER
(Pulled by Truck)



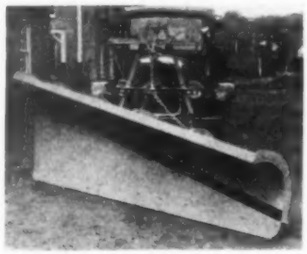
A moderate priced machine. Where heavy trucks with special low speeds are available, this is most rapid spreading box ever offered for gravel, stone, slag, etc. Adjustable, oscillating, vibrated screed also lays binder and top—100 tons per hour are possible with new smoothness of surface and minimum of hand work.

Four wheels carry 70 per cent of load—reduce drawbar pull to minimum. Has features of long straight-edge equalizing runners, 1" to 7" spread with any crown and no weight or traction on newly laid materials, same as our power driven Bituminous Paver. Adjustable 9′—11′ by means of blender screeds.

Two "Vibros" spreading crushed stone. Note perfect match between strips.

DANGER!

Snow and glare ice —"the killers"— have arrived!



Take no chances — safeguard your highways with

GOOD ROADS

CHAMPION SNOW PLOWS
Catalog No. 53

SAND & CINDER SPREADERS
Bulletin No. 50

Products of

GOOD ROADS MACHINERY Corporation

KENNETT SQUARE, PENNA.

PUMPS FOR ALL PURPOSES

Name Your Pump Requirements

Fig. 909

Roper rotary gear type pumps are made in a wide variety of sizes, capacities and with maximum mounting flexibility. For pumping lubricating or non-lubricating liquids. Types for general transfer or hydraulic pressure applications. The Roper line is complete . . . and flexible. Write for Bulletin No. R-5-R.

Dependable Pumps Since 1857

GEO. D. ROPER CORP., ROCKFORD, ILLINOIS

THE HEART OF POWER

ROPER PUMPS

Combination of Snow Removal and Sanding Equipment

The illustration shows the latest addition to the snow removal equipment owned by the Delaware River Joint Commission, who control the massive suspension bridge spanning the Delaware river, connecting the Pennsylvania and New Jersey shores at Philadelphia, Pa., and Camden, N. J. The outfit shown on the Model BF Mack truck, consists of a "Good Road" Champion Model 32-A one-way blade snow plow equipped with hand hydraulic lift. Although of the one-way type, the blades have adjustment for varying tilting and plowing angles and the exclusive "Good Road" automatic safety blade trip allowing operation at high speed with safety. These features are embodied in all "Good Roads" blade plows of both the reversible and one-way types. Large diameter, spring mounted, roller bearing, full

Latest Addition to Snow Removal Equipment of Delaware River Bridge Commission.

swivelling castor wheels support the plow minimizing the frictional load on the truck and conserving the motive power for the work of snow removal. The wider arc of the strongly trussed semicircles dirstributes thrust evenly over the entire length of moldboard through four hinged connections. The push frame connection to moldboard is through a swivelling push bar arrangement, permitting free oscillation of the plow to suit the contour of the highway. To the rear of the truck is attached a "Good Roads" sand and cinder spreader, for effectively spreading the materials quickly and in controlled quantity over the slippery surface. "Good Roads" spreaders are extremely strong and durable, but of minimum weight and easily handled. They are mounted upon steel rubber-tired wheels. The gears operating spinner disc are of special alloy steel with cut teeth and fully enclosed in an oil-tight housing. Both wheel and pinion shafts are fitted with tapered roller bearings. During periods of clear weather both units may be detached, and the truck used in other service. Upon the approach of storm conditions, either the plow, or spreader, or both can be attached within a few minutes and the truck loaded with material for spreading.

▼

New Spreader Finisher

A screed vibrated at 3,500 r.p.m. for vibratory spreading, striking off and finishing, 15 ft. long "straight-edge" sled runners, which act as forms, equalize high spots and smooth the surface, and a telescoping main frame used in combination with screed extension wings to give 9 to 14 ft. width adjustability—these are some of the features of the Vibro-Spreader which The Jaeger Machine Co., Columbus, O., developed for laying secondary roads.

The machine spreads gravel, rock, slurry, armor plate, macadam and hot or cold bituminous mixes—leveling, binder and top course —any width from 9 to 14 ft., any thickness between 1 and 8 in. On 2- and 3-lane work the clean-up or flushing wings insure proper blending of strips and uniform density.

The vibration of the screed, which is also imparted to the sled runners, keeps materials plastic and the load "alive," reducing draw-bar pull and making possible much faster spreading, it is stated. Once over with the Vibro-Screed places rock. Macadam and bituminous mixes, hot or cold, are placed ready for rolling as fast as they can be fed.

In addition to the smoother surface, due to the long sled runners, this increased speed and capacity offer the advantage of real job savings, according to the manufacturer.

New Wagon Drill

A recent addition to its extensive line of drilling equipment announced by the Worthington Pump and Machinery Corporation of Harrison, N. J., was the new Rock Master, which has been developed to speed up many classes of drilling that require a lightweight mobile rig. This rig is readily adaptable for down-hole drilling, line drilling, hillside drilling, breast-hole drilling, side-hole drilling and snake-hole drilling. It can be readily moved from place to place and can be taken to any job where a hand drill can be used. It is used extensively for deep-hole drilling up to 20 ft., supplemented by hand-held drills for boulder popping.

The Rock Master is equipped with a quick and effective hole-spotting device; can be furnished with feeds to accommodate a 3 ft., 4 ft. or 6 ft. maximum steel change; is recommended for holes up to 20 ft. depth; and can be readily equipped with a Worthington No. 27, No. 69, No. 80 or No. 521 pneumatic feed drifter . . . in either wet or dry types.

▼

Road Finishing Machine with Surface Vibrator

A Blaw-Knox gas-electric road finisher of 20 ft. width equipped with a surface vibrator for concrete pavement construction was a product of the Blaw-Knox Co., Pittsburgh, Pa. This machine is also equipped with the usual double screed.

The vibrator attachment consists of two independent 10-ft. units, each operated with an independent motor drive. Each of the vibrators is equipped with two vibrating elements, making a total of four. All controls are located at the center of the machine for the convenience of the operator.

The front screed of the finisher is arranged for striking off the concrete at a variable adjustable height above the top of the side forms in order to provide the required excess of concrete to be compacted by vibration.

With the first trip, the concrete is struck off with the front screed and simultaneously vibrated down to the level of the top of the form. The pavement is then double-screeded in the conventional manner.

One operator controls the entire vibrating and finishing process with no delay to production.

This surface vibrator has the following features:

1. The vibrating member is supported entirely on the surface of the concrete slab; it does not touch the side forms. This eliminates danger of settling or tipping of the forms.
2. The complete vibration unit is spring-suspended from the finishing machine. Vibration is not transmitted into the machine, all of the vibration being absorbed by the concrete.
3. The frequency and amplitude of vibration is adjustable over a wide range to suit varying concrete mixes.

This surface vibrator attachment is furnished in any width required, and to operate below the top of the side forms where necessary.

▼

Safety Flasher Signals of the Lakewood Engineering Co.

Neon illuminated flashing road signs stated to operate at a cost of only one cent per 24 hours for current were announced by The Lakewood Engineering Co., Columbus, O., makers of Safety Neon Flashers.

The signals are entirely self contained and can be installed anywhere without wiring or cables, being operated by special type Willard storage battery which provides the fixed voltage needed for signal operation for uninterrupted periods of either 6 or 15 months without adding water or recharging. This is made possible by the fact that the special battery has a shelf discharge of less than 8% in 1,000 days. A larger battery is used for the 15-month operation. Batteries are rechargeable during an estimated life of 6 to 10 years.

The safety flasher motor used in the units is of positive, clock-type mechanism, fully enclosed and insulated. According to the Lakewood Company this motor is capable of operating under all changes of temperature and humidity, in any position and under conditions of severe oscillation and vibration. Both battery and flasher are usually mounted in the base of the sign, underground, for greater safety. Where underground mounting is impractical a battery-in-head type is furnished.

Illumination is produced by neon tubing behind cut-out letters and symbols in the cast aluminum sign face, which are shielded with shatter-proof glass.

Specify

TRINIDASCO

—cold-laid Asphalt Pavements

Trinidasco—the Native Lake asphalt mixture that is laid cold—is prepared with the same grades of stone, sand and other mineral aggregate and Trinidad Lake Asphalt used since 1876 in the construction of standard types of Trinidad hot-mix pavements.

Trinidad is the safest asphalt for durability. Trinidasco cold-laid pavements have a high coefficient of friction, and are safe for modern traffic.

Trinidasco cold-laid pavements are used for new construction . . . for resurfacing . . . for maintenance. Trinidasco is convenient . . . can be laid with hand tools or mechanical devices immediately after preparation, or from stock piles.

Specifications and full particulars covering mixtures for asphaltic concrete, asphalt macadam and sheet asphalt (binder and top) pavements furnished on request.

THE BARBER ASPHALT COMPANY

Philadelphia

NRA MEMBER U.S. WE DO OUR PART

New York Chicago St. Louis

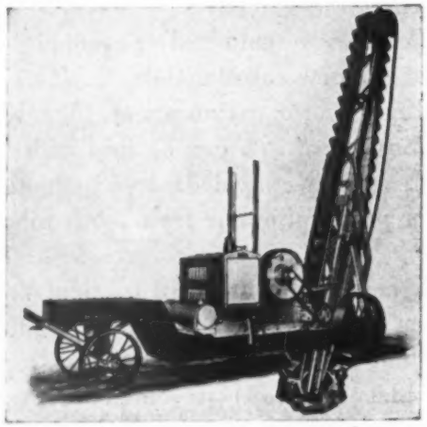
SNOW PLOW

Highly efficient low cost snow removal tool especially adapted for sidewalk and private drive work and as a clean-up tool on streets. Pushes snow from rear axle, not from front end only. Transportation speed from 1¼ to 25 m.h.p. Removal of two pins converts plow into a regular tractor capable of doing hundreds of odd jobs the year around.

SEND FOR ILLUSTRATED BULLETIN

THE FATE-ROOT-HEATH COMPANY
PLYMOUTH, OHIO

the famous Forty-Niner



leads the way in '34

Climaxing a long line of improvements, Gruendler now offers to the road builders of today the latest type of portable crushing unit—the famous FORTY-NINER. This modern outfit, including a truck-mounted crusher and elevator, sets a new standard in crushing machinery. It represents the sum total of Gruendler experience and progress since 1885.

Write for the new Bulletin which gives complete details of the Gruendler Forty-Niner, Straight Line Crushing and Screening Plants, Gravel Screening and Crushing Plant

GRUENDLER
CRUSHER & PULVERIZER CO.
2915 North Market St., Dept. RS.
ST. LOUIS, MO.

It is pointed out that improved highways, faster motors and increase of night travel have created a real need for illuminated street and highway signs and safety zone markers which have, hitherto, been costly to install and operate by outside wiring.

Not being dependent on reflected headlamp beams the faces are mounted 7½ feet above street level where they cannot be hidden by parked or traveling cars ahead. At night the neon illuminated signal is said to be visible to approaching drivers at 1 mile and legible to the average eye at 500 ft. distance.

▼

New Jaeger-Lakewood Finishing Machine

A new combination of automatic, high speed operation with velvet touch screeding is claimed for the new Type "D" Finisher, placed on the market by the Jaeger Machine Co., Columbus, O. It is claimed that the rigid, box-type 12-inch screeds, moved evenly and smoothly by double equalizing connecting rods with link motion, and with toggled radius rod construction which eliminates all radial swing, give a new road-ability to concrete and bituminous surfaces and eliminate most of the costly hand work behind the finisher. Positive, automatic power lift raises and lowers the heavy screeds in 2 seconds. Each screed is independently controlled.

The machine has working speeds of 8 and 12 ft. per minute forward and 40 to 90 ft. reverse, combined with automatic increase of screed strokes to a maximum of 36 cycles or 72 strokes per minute.

Automotive type transmission, with heat-treated chrome vanadium gears and shafts carried on Timken bearings and running in oil, drives direct to all four wheels. Built-in differential and brakes permit steering with a lever to straighten machine on the forms and to round curves. Telescoping rigid steel frame for quicker 2 ft. width adjustments; accessible, 75 per cent faster crown resetting and adjustments; 14-in. wheels mounted outside for quick changes; Timken bearings throughout and new transportation device, which eliminates all blocks and shoring, are other features emphasized by the manufacturer.

Jaeger-Lakewood vibrating attachment, mounted direct on screeds and used successfully on many jobs, is offered in combination with bullnose front screed.

The standard Type "D" machine shown above is furnished with 4-cylinder, 10-15 h.p. gasoline engine with flexible throttle control for intermediate speed ranges. The same machine is also built with gas-electric power, the engine and generator producing current for the operating motors with reserve power sufficient for extra load where vibrating attachment is used and also for operating lights when needed on the job.

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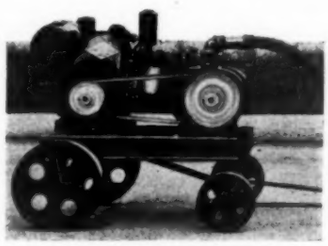
Unit for Cleaning Out Pavement Cracks

A portable blowing unit for cleaning out cracks in pavements preparatory to filling them with patching material is a

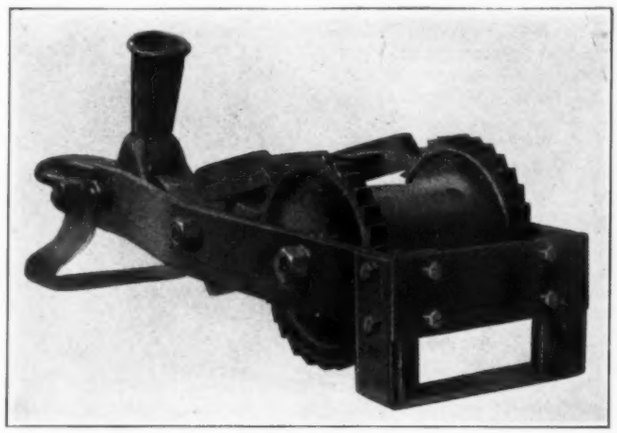


Portable Blowing Unit.

product of the Roots-Connersville Blower Corp., Connersville, Ind. The outfit consists of a Victor-Acme No. 36G Portable blow V-belted to a 1 HP. gasoline engine, delivering 50 cu. ft. of free air per minute against 2 lb. pressure. The outfit is furnished complete with 15 ft. of 1¼-in. reinforced hose and tapered nozzle.

New Pulling Jack

A new pulling jack having many uses in construction operations has been brought out by the Pierce-Miller Co., Brazil, Ind. The jack is 36 in. long, 10 in. wide and weighs about 150 lb. It is constructed of the very highest quality steel—pawls being chrome steel. It is stated this Pierce pulling jack will



Pierce Pulling Jack.

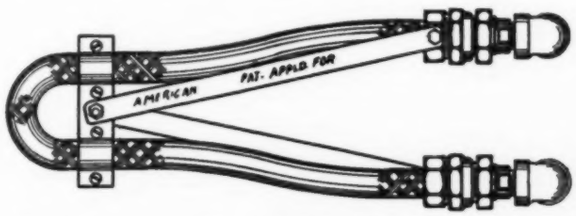
exert pressure equal to the breaking strain of any of the following cable sizes, and is constructed to use any of these sizes. However, it is never advisable in practice to work near the breaking point of the pulling medium, hence the following working loads are recommended as maximums for safety:

Cable Sizes In.	Average Breaking Strain Tons	Working Load Not Exceeding Tons
3/8	4	2
7/16	6	3
1/2	8	4
9/16	10	5
5/8	12	6

New Flexible Metal Tubing

The new brass bracket is a patented feature of the American Metal Hose Branch of the American Brass Co., Waterbury, Conn., latest product—American flexible steam connections for movable platen presses. Designed by the company engineers the product is a combination of American flexible seamless tubing and the brass bracket support.

The flexible tubing, the conducting element of the assembly, is seamless and absolutely free from welds, joints, seams, laps, or packing. It is made from a drawn tubing of special bronze.



Showing Construction of New Flexible Seamless Tubing and Brass Bracket Support

Deep helical corrugations die-formed into the tubing impart the necessary flexibility.

The bracket is attached to the flexible tubing in such a manner that flexing of the tubing is equal at all points and the tubing is held constantly in a horizontal position thus preventing sagging and the possibility of water pockets forming. Said to control the movement of the tubing within well defined limits.

The assembly is applicable to either series or individually connected platens, and manufactured in popular sizes for every travel.

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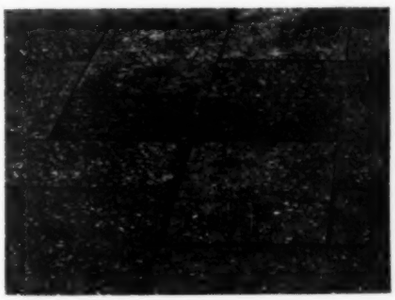
EXPANSIONJOINTS
CORK BOARD
METAL CUSHION JOINT
ASPHALT PLANK (Standard)
MINERAL SURFACED PLANK
CEMENT TREAD PLANK
WATERPROOFING
COURSE ROOFINGS

Servicised Cork Rubber Expansion Joint

Servicised Sponge Rubber Joint



Servicised Rock Surfaced Plank

Servicised Quality Products have been sold throughout the United States for upwards of 13 years. Thousands of installations attest the recognition and approval accorded them by State Highway Departments and Engineers.

Our products find ready acceptance and our distributors are given wholehearted cooperation in their sales efforts, for despite adverse economic conditions, there has been no let-down in the high standard of quality established when our first product was introduced.

Inquiries will receive prompt attention. Write today.

Servicised Felt Reinforced Joint

Servicised Type "B" Joint

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Sauerman Cableway Bucket Dumping Load Into Hopper.

When you have an excavation job that calls for moving dirt several hundred feet or more, isn't it logical to use a machine that will reach the entire distance and eliminate any rehandling of the dirt.

Sauerman Long Range machines will do just that—reach any distance from 100 to 1,500 ft. and handle the digging, hauling and disposal of the dirt in one operation.

Write for Catalogs.

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Drag Scraper Making a Side-hill Fill.

for BETTER ROADS at LOWER COST

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Stone Spreaders
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The Ross Snow Plow

● THE BURCH CORPORATION, CRESTLINE, OHIO

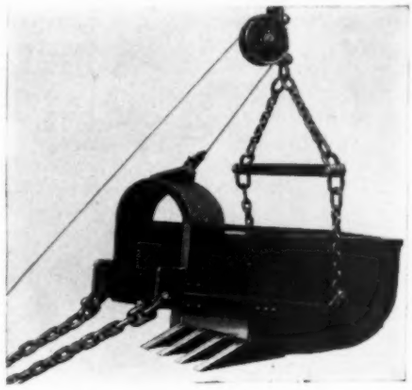
THE BURCH

Side-o-Truck Shoulder Builder and Maintainer working road shoulders thoroughly at an average cost of 15c per mile.

New All-Welded Bucket

A new lightweight bucket, designed to reduce dead weight to a minimum and at the same time provide great strength through all-welded construction, has just been announced by the Harnischfeger Corporation of Milwaukee.

The bottom, sides and back are formed by a single heavy steel plate securely seamed at the back and with a heavy angle reinforcement mounted around the entire upper edge for additional rigidity. Four forged wearing-shoes or runners are welded to the bottom to take the wear from the bucket shell.



New Lightweight Bucket of All-Welded Construction

The arc and side reinforcements are fabricated as a single unit with the lip plate, the latter being 2 in. thick and capable of taking the punishment of a much heavier bucket.

Cold Rolled Phosphor Bronze Plates for Bridge

Metallurgists of the Anaconda Copper Co. have developed a cold rolled phosphor bronze plate for use as bearing and expansion plates in bridges. The plates not only satisfy the tensile strength and compression values of the A. S. T. M. specifications for bridge plates, but, being a wrought material, insure freedom from porosity and minimize the possibility of breakage. Cold rolled plates have a smooth, uniform surface and can be installed without machining.

In addition to physical and engineering advantages, bridge plates of cold rolled phosphor bronze are stated to have proven more economical to use than cast plates of the same metal. Because they are furnished to the job, sawed accurately to dimensions and drilled for rivet or bolt holes, they can be put in place immediately without the time and expense previously required for machining and fitting.

Cold Rolled Phosphor Bronze Plate for Bridge

A TRAILER *on* PNEUMATICS

for little more than the cost of

Solid TIRED *Equipment!*

A TRAILER FOR EVERY HAULAGE PROBLEM!

New small diameter heavy duty tire design makes possible pneumatic equipment at little more than the cost of solid tires.

The new tires require only a 15-inch wheel which assures increased strength and a deck that is lower and more easily loaded than that of any other trailer on the market.

LaCrosse Tu-Way Trailers can be towed from either end, load from either side or end, steer from either end, have eight wheel brakes controlled from either end and meet all state specifications as to width.

If you need a trailer find out about LaCrosse capacities and prices before you buy.

C. R. JAHN CO.

760 Polk St. Chicago, Ill.

Available also in flat deck and goose neck types!

Cold Lay Asphaltic Limestone

The illustration shows the spreading with a motor patrol of 30 lb. of cold lay asphaltic limestone (a porduct of the Alabama Asphaltic Limestone Co., Birmingham, Ala.) on a bituminous surface. Cold fluxed asphaltic limestone is very dense and impervious to moisture and is claimed to make an absolute seal for any surface that it is laid on. The material has been used extensively during the past year or two for sealing surface treatments and road mixes. It has also been used in several states to seal worn asphaltic concrete or other bituminous pavements which were worn or cracked.

Spreading Cold Lay Asphaltic Limestone on a Bituminous Surface.

While originally used as a seal coat it was found in observing jobs that the cold fluxed asphaltic limestone was an excellent material to use for smoothing up hard surface pavements which for any reason were rough and out of shape. The material being spread with a motor patrol is compacted during the process of building up the thickness used and it is possible to smooth up an old pavement with this material spread with a blade and secure a smooth true riding surface without doing any preliminary hand patching on the old pavement.

Davenport Besler Announce New Locomotive Series

Announcement is made by the Davenport Locomotive Works, a division of the Davenport Besler Corporation of Davenport, Iowa, of a new series of industrial gasoline and Diesel geared locomotives ranging in capacity from 2½ to 25 tons.

6-ton Davenport Diesel Geared Locomotive for Industrial Service.

The latest, most approved types of power plants are utilized in powering these new Davenports. Particularly noteworthy is the Diesel type of unit. These locomotives are rugged, have a wide range of speeds and are capable of maximum hauling

CUMMER ASPHALT PLANTS

COMBINATION HOT AND COLD MIX PORTABLE AND STATIONARY

TWO-FIRE DRYER-COOLER FOR EITHER HOT OR COLD MIX

NO SILOS MANY IN OPERATION

LARGE CAPACITY PORTABLE PLANTS WITH ONE-TON, 1½-TON OR TWO-TON MIXER

Heavy Duty Mixers for Cold Mix. 3-ton, 2-ton, 1½-ton and 1-ton.

THE F. D. CUMMER & SON COMPANY, 17th & Euclid, Cleveland, Ohio

power at speeds as low as 2½ to 3 miles per hour according to the size of the unit.

The cabs are roomy and comfortable with convenient controls and instrument panels which keep the operator completely informed concerning the operating essentials at all times.

Powerful hand operated lever type brakes are standard on all of the smaller sizes up to twelve tons. On the 7 to 12-ton sizes air brakes are optional. The 15 to 25-ton sizes are standard equipped with air brakes and auxiliary hand operated brakes of lever type.

▼

A New Wagon Drill

The Cleveland Rock Drill Co., Cleveland, O., announced its model "WD" wagon drill.

The Model WD Wagon Drill

When feeding into the rock, the mechanism is claimed to automatically maintain the drilling machine at just the right position for fastest cutting. It is further claimed that when reversing or when approaching the rock, the speed of feeding may be varied from a few inches to 25 ft. or more per second. Very little air is required for the feeding mechanism, not over 4 cu. ft. per minute for ordinary rates of feed.

The air feed cylinder serves as a boom or support for the guideways on which the slabback mounted machine travels when being fed into or reversed away from the rock. The boom is mounted on an offset "U-bar" which can be fixed in any position around the center line of the wheel axle. This arrangement permits of placing the machine in an infinite variety of positions, heights and angles.

The drilling machine which has been designed for use with this wagon drill is provided with a special blower. A slight pull on the blowing valve lever suddenly turns full pressure through a ¾-in. hole into the chuck chamber at the end of the shank, automatically short stroking the hammer and blowing any hole. This hole blowing feature can be incorporated in a wet drill as well as in the dry construction.

▼

New 10-S Mixer

The Koehring Co., Milwaukee, Wis., developed a new 10-S Dandie Trail-Mix, having all the superior features of the recently announced four wheel type 10-S Dandie mixer.

The charging skip of the Dandie Trail-Mix is free from obstruction at the front and side, permitting convenient and fast loading. The machine has the Koehring automatic skip-flow shaker which actuates the skip up and down, causing shaking along the natural flow-line of the material.

Anti-friction bearings, V belt drive, automotive type steering, full-floating spring mounting, are a few of important advantages to be had in this modern machine.

New Concrete Grinder

A machine new in principle that is claimed to cut concrete surfaces at exceptionally low cost and speed and accuracy has been placed on the market by the American Floor Surfacing Machine Co., 508 South St. Clair St., Toledo, O. The machine is driven by a gasoline engine and has a dust collecting system that removes the large volume of dust as the concrete is ground so that the cutting head is always working on a clear surface. The cutter head rotates at a high speed and the cutters do their work at a rapid rate which is due to placing them around the cylindrical surface of the cutter head. The rotary action of the cutter head placed in a horizontal position gives a smooth, keep cutting action. The machine is perfectly balanced on two truck wheels and requires practically no effort to operate. The large truck wheels also make easy portability over the highway.

The cutter head is made of two heavy sections of steel arranged so that a new set of cutters can easily be assembled in place. The cutters are made of hardened, high grade steel and are of the star wheel type, 72 being in each assembly. The pressure on the cutter head is regulated by an adjustable weight, and it is stated the right amount of pressure can be maintained at all times for rapidly cutting hard or soft concrete surfaces.

It is stated that a total of 172 bumps ranging from small to large in a 3-mile section of new laid concrete road were ground down to a perfect level in just 14 hours with this machine.

▼

New Bolt Clipper

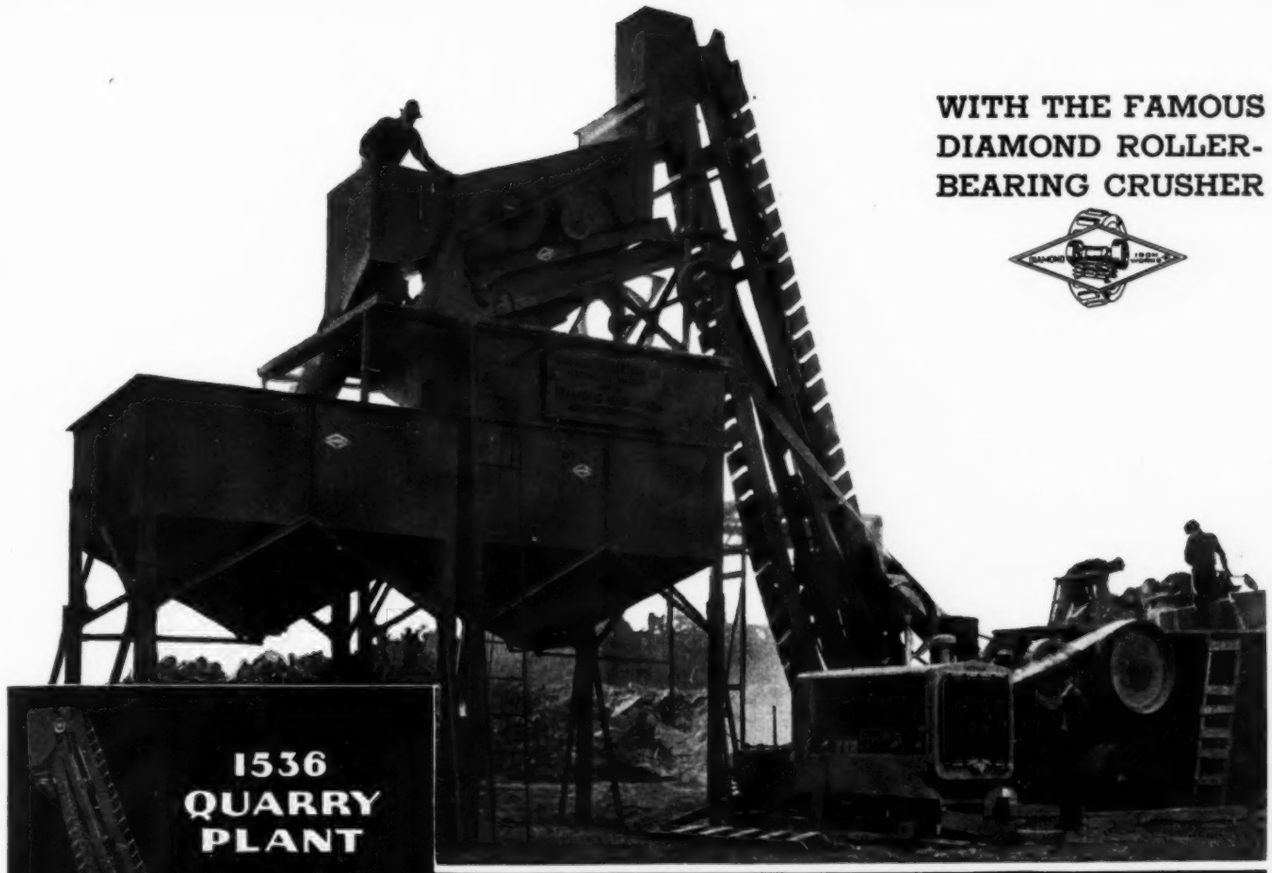
An ingenious but simple device has made the standard bolt clipper a tool practically universal in its application.

The HKP swivel head cutter, a product of H. K. Porter, Inc., Everett, Mass., works equally well up or down, right or left, behind or before, in or out, because the cutting head swivels to any angle on either side of the handles (from nothing to a right angle). This tool works just as effectively in any of these positions as does the rigid type Porter tool, which has been the standard for more than half a century.

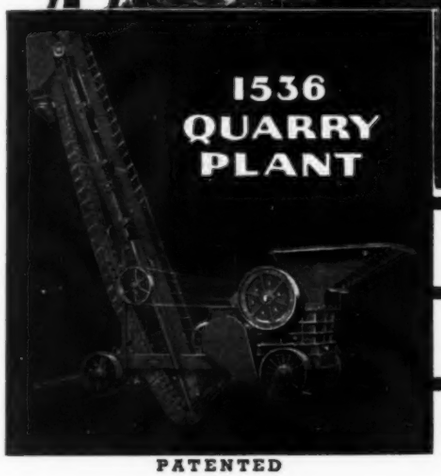
Swivel Head Cutter in Operation

A special section joined by a ball and socket joint, with a shoe for holding the cutterhead and a positioning spring to hold the head in the desired position, are all the changes employed. The shoe will hold any standard head of a given size, clipper cut, center cut, chain cutter, nut splitter, etc., and the change from one head to another can be made in a jiffy and on the job.

A kit can also be had by which a standard Porter tool can be made into this universal swivel type at small expense.



WITH THE FAMOUS DIAMOND ROLLER-BEARING CRUSHER



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WITH ACCURATE SIZING

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These enthusiastic statements reflect the reason for the enviable reputation attained by the 1536 quarry plant.

The Patented combination of the Diamond roller bearing jaw and roller crushers provides a unit with a capacity which insures a profit on every job.

Produces material to the most rigid specifications.

Portable crushing and screening plants–vibrating, shaker and revolving screens–anti-friction conveyors–roller bearing jaw crushers–plate feeders–roller bearing roll crusher–bucket elevators.

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